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METALS and ALLOYS

The Magazine of Metallurgical Engineering

PRODUCTION • FABRICATION • TREATMENT • APPLICATION

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ARTICLES

METALLURGICAL ABSTRACTS


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TECHNICAL PROGRAMS OF THE

IRON AND STEEL AND INSTITUTE OF METALS DIVISIONS

OF THE A.I.M.E.

The annual convention of the American Institute of Mining and Metallurgical Engineers will be held at the Engineering Societies Building, New York, February 15 to 19. During that week there will be the usual technical sessions of the Iron and Steel Division and the Institute of Metals Division of the Society. Besides these regular sessions on Tuesday, Wednesday and Thursday, February 16, 17 and 18, there will also be the Howe Memorial Lecture by Dr. Paul D. Merica on February 18, and the Institute of Metals Lecture by R. S. Hutton, professor of metallurgy, University of Cambridge, England, on February 17.

The usual dinner of the Institute of Metals Division is scheduled for 6:30 P. M. February 18. The annual dinner will be held at the Waldorf-Astoria in the evening of February 17. The technical programs of the two divisions are as follows:

IRON AND STEEL DIVISION

Feb. 16

CRYSTALLIZATION

:00 P.M. "Preferred Orientation in Iron-Silicon Alloys," by C. S. Barrett, G. Ansel and R. F. Mehl.
"Primary Crystallization of Metals," by F. R. Hensel.
"Studies Upon the Widmanstatten Structure, VIII.—The Gamma-alpha Transformation in Iron-Nickel Alloys," by Robert F. Mehl and Gerhard Derge.

1 15 P.M. Luncheon Meeting. Executive Committee. Engineers' Club.

00 P.M. Joint Session of Blast Furnaces and Raw Materials Committee and Milling Methods Committee.

Feb. 17

INGOT SOLIDIFICATION

9 30 A.M. "Rate of Solidification of Rimming Ingots," by John Chipman and C. R. Fon Dersmith.
"The Structure of Rimmed Steel Ingots," by T. S. Washburn and J. H. Nead.
"Some Factors Influencing Segregation and Solidification in Steel Ingots," by Leon H. Nelson.
"Some Remarks Regarding the Freezing of Steel Ingots," by Carl Benedicks and H. Löfquist.
"The Effect of Temperature Upon the Interaction of Gases with Liquid Steel," by John Chipman and A. M. Samarin.

12:15 P.M. Luncheon Meeting, Executive Committee, Open-Hearth Committee. Engineers' Club.

2:00 P.M.

OXIDES IN STEEL

"Cooperative Study of Methods for Determination of Oxygen in Steel," by J. G. Thompson, H. C. Vacher and H. A. Bright.
"Fractional Vacuum Fusion Analysis of the Bureau of Standards Steels for the Determination of Oxygen," by S. L. Hoyt and M. A. Scheil.
"Oxides in Basic Pig Iron and in Basic Open-Hearth Steel," by T. L. Joseph.

4:00 P.M. Institute of Metals Division Lecture. "Refractories," by R. S. Hutton.

Feb. 18

IRON CARBON EQUILIBRIUM DIAGRAM

9:30 A.M. "The Constitution of High-Purity Iron-Carbon Alloys," by R. F. Mehl and Cyril Wells."
"A Suggested Equilibrium Diagram for Cast Iron," by Roy M. Allen.
"The Freezing of Cast Iron," by Alfred Boyle.

12:30 P.M. Luncheon Meeting, Iron and Steel Division. Engineers' Club.

2:00 P.M.

GENERAL FERROUS METALLURGY

"Fine-grained Steels for Low Temperature Service," by A. B. Kinzel, Walter Crafts and John J. Egan.
"Oxide Films on Iron," by Robert F. Mehl and Edward L. McCandless.

4:00 P.M. Howe Memorial Lecture.
"Progress in the Improvement of Cast Iron and the Use of Alloys," by Paul D. Merica, vice president, International Nickel Co., Inc., New York.

INSTITUTE OF METALS DIVISION

Feb. 17

ORIENTATION

9:30 A.M. "The Stereographic Projection," by Charles S. Barrett.
"Studies Upon the Widmanstatten Structure, IX.—The Mg-Mg_2Sn and Pb-Sb Systems," by Gerhard Derge, Arthur R. Kommel and Robert F. Mehl.
"Lattice Relationships Developed by the Peritectic Transformation Alpha plus Liquid to Beta in the Cu-Zn System," by Alden B. Greninger.

12:15 P.M. Luncheon Meeting, Executive Committee, Engineers' Club.

2:00 P.M.

PROPERTIES OF ALLOYS

"An Investigation to Develop Hard Alloys of Silver for Lining the Grooves of Light Alloy Pistons," by Claus G. Goetzel.
"Lead Coating of Steel," by J. L. Bray.
"The Fatigue Properties of Five Cold-Rolled Copper Alloys," by William B. Price and Ralph W. Bailey.
"Properties of Alloys of Cadmium and Mercury with Small Percentages of Nickel," by Telfer E. Norman and Owen W. Ellis.

4:00 P.M. Institute of Metals Division Lecture.
"Refractories," by R. S. Hutton, professor of metallurgy, University of Cambridge, England.

Feb. 18

DEFORMATION

9:30 A.M. "Influence of Temperature on Elastic Limit of Single Crystals of Aluminum, Silver and Zinc," by Richard F. Miller and W. E. Milligan.
"Relations Between Stress and Reduction in Area for the Cold Working of Metals in Tension," by Charles W. MacGregor.
"Equipment for Routine Creep Tests on Zinc and Zinc Alloys at Ordinary Temperatures and an Example of Its Application," by J. Ruzicka.
"Effect of Inverse Deformation on Recrystallization," by Paul A. Beck.

2:00 P.M.

GENERAL PHYSICAL METALLURGY

"Thermodynamic Calculations Concerning Certain Alloys of Tungsten and Molybdenum with Other Elements," by W. P. Sykes and H. A. Schwartz.
"Thermal and Electrical Conductivities of Aluminum Alloys," by L. W. Kempf, C. S. Smith and C. S. Taylor.
"Segregation in Solid Solution Alloy Single Crystals," by Arthur Phillips and R. M. Brick.
"Diffusion of Copper and Magnesium into Aluminum," by R. M. Brick and Arthur Phillips.

4:00 P.M. Howe Memorial Lecture. "Progress in the Improvement of Cast Iron and the Use of Alloys," by P. D. Merica.

6:30 P.M. Institute of Metals Division Dinner, East Ball Room, Commodore Hotel.
After-dinner talk, "Contributions to a Way Out of Today's Economic Muddle," by Samuel S. Wyer.

In addition to these programs, there are sessions on "Non-Ferrous Metallurgy" on Monday, February 15, morning and afternoon, covering copper, lead and zinc ores.

Highlights

WRITTEN BY THE ABSTRACT SECTION EDITORS AND THE EDITORIAL STAFF

Do you want to know what metallurgical engineers are saying, the world over? Look in the Current Metallurgical Abstracts. Here are some of the points covered by authors whose articles are abstracted in this issue.

Faster Cooling at the Center of Ingots?

Jhegalov—a name that comes trippingly off the tongue—(page MA 70L4) claims that the center of a cooling ingot cools faster than other portions except the extreme skin! This alleged pulling of heat from a region of lower to one of higher temperature would certainly be interesting if true. We'd be inclined to suspect that the thermocouple at the center went haywire. This is a good example of authors who draw conclusions from what they think they see. Unless the abstractor is on his toes, he is likely to repeat as a fact what the author thought was a fact. Revolutionary conclusions should not be kept out of published literature, for sometimes they prove correct, but readers should not accept such conclusions too readily, especially when they appear from Russian or Japanese sources, for in these countries there appear to be no "publication committees" to question conclusions and get them substantiated before publication.—H.W.G.

Page Gathmann

The title of Hirone's article (page MA 68R7) on "internal stress due to cooling in spherical steel ingots" is a bit surprising at first, for we'd like to watch a spherical ingot rolled. However, it turns out that instead of a real ingot this is just a mathematical one assumed to make the mathematics easier.—H.W.G.

Screw Stock

That hardy perennial, evaluation of the free-cutting properties of screw stock, crops up again in several German articles (page MA 76L8, L9, R1, R2 and R3). If it's any comfort, the Germans are as puzzled as we are.—H.W.G.

Light On Magnetic Transformation

Bergmann (page MA 101L8) has developed a photographic method of recording the Curie point of ferromagnetic materials.—F.P.P.

Inevitable

The day will probably come when Jette will have X-ray investigated every binary system. With Foote (page MA 101L3) he probes the Fe-Ni alloys, with Fetz (page MA 101R9) the Ni-Sn system, and with Greiner (page Ma 101L4) Fe-Si equilibria. —F.P.P.

Welding Jigs

Welding jigs, properly designed and used, actually make possible successful welded articles which could not be constructed without them. The chief purposes of welding jigs are three-fold: (1) to eliminate or control warping, crawling, buckling and distortion due to heat effects in the work parts, by absorbing and dissipating heat into the jig structure, or by forcible restraint; (2) to locate the parts to be joined by welding in the required position and relation, to assure uniformity of size, shape and position of the components when assembled by welding; (3) to hold parts in level position for welding or hard-facing and convenient to the operator, so that his efforts will be expended to the best advantage.

Correct design of welding jigs depends upon: (a) the number of articles to be produced and whether the jig will be simply a holding device or will have to perform a fitting function as well; (b) the position of all locating points, their mechanical movements, the effect of the welding heat on them and their visibility to the operator; (c) easy and smooth operation, as output depends largely on ease of loading and handling; (d) construction to enable work to be inserted in correct position only; (e) adjustable locating points to make jig flexible and allow for rough work or similar work of a different size to be handled on the same jig; (f) clamps positioned away from weld so as not to overheat, but to be made integral parts of jig and of quick operating type; (g) allowance for control of heat in both jig and work; (h) avoidance of sharp corners and edges that might injure operator and provision of suitable handles for operating or moving jig; (i) fabrication by welding and cutting in many cases to secure lightness with rigidity and strength (page MA 89R5 and R6.)—E.V.D.

Aluminum in Tool Steel

Amberg and Hultgren (page MA 68R5) discuss addition of Al to carbon tool steel apparently from the point of view of adjusting the type of the visible inclusons rather than from that of "body." Greater benefit is claimed when Al is added to the mold after it is filled rather than to the ladle. But what happens to the skin of the ingot that is freezing while the Al is added? Won't the skin have a different "body?" Will the skin always be removed so that only the interior counts?—H.W.G.

Oxyacetylene Flame Hardening

This method consists primarily of rapidly heating the surface of the part with an oxyacetylene flame to a temperature appreciably above the critical point and then quenching from that temperature. A hardened case to the surface layer on the metal results without altering the chemical composition. The depth of the hardened layer may be varied from a mere skin to ¼ in. or more, according to the operating practice and the type of material. Surface hardness obtainable by torch hardening is approximately the same as by heating in a conventional furnace and water quenching.

Steels employed must be of a chemical composition which responds to heating and quenching. In carbon steels the carbon content should be at least 0.40 per cent. The best range is between 0.40-0.70 per cent carbon. Steels of greater carbon content have been successfully hardened, but care must be exercised to prevent surface checking or cracking. Low alloy steels are well adapted for hardening by this process. Most of these harden to a good degree and can be heated and quenched without danger of cracking or checking.

When hardening a straight surface, a torch with multi-flame tip of sufficient area to cover the path of the section being treated is directed against the surface of the work and moved forward at the maximum speed which will bring the piece to the desired hardening temperature. Immediately behind the torch follows a stream of water, impinging upon and progressively quenching the heated surface. In some instances, air or nitrogen are used for quenching mediums. Usual speed of operation may range from 4 to 10 in. per minute, depending on nature of work, hardness and depth of penetration desired.

Oxyacetylene flame hardening was first applied to gear teeth and rail ends. Large gears and pinions that are difficult to harden in the regular manner or cannot be heat treated because of their size are successfully hardened on wearing surfaces of teeth only, leaving the remainder of the gear unaffected. Both circular and straight ways on machine tools are being flame hardened and show remarkable increases in life. Trackways, cams, camshafts, worms, jaw clutches on large machines and cranes, trackwheels for conveyors and cranes are some other applications of flame hardening.

The chief advantage of the process is the ability to localize the heating. While the surfaces of the piece subjected to wear are hardened, the inside section or core still retains its original toughness and strength, (page MA 89R4).—E.V.D.

Low Silicon Cast Iron

Leonard (page MA 68R10) discusses the runability of cast iron in respect to Si content and extends his experiments to as low as 0.30 per cent Si, which seems a bit low for cast iron, but this was merely experimental extension below commercial limits. We're always a bit suspicious of maxima and minima in anything at short intervals, so we'd want to be sure that Leonard's maxima and minima occurring every 0.2 per cent Si from 0.3 to 1 per cent were real before we worry about their existence.—H.W.G.

Welding Goes Hollywood

Crawford and Richter (page MA 89R7), describe high speed motion pictures of flash welding, while Lippert's title "'The Invisible Ray' It Welds—It Smelts" (page MA 89R8), smelts de Mille-ish.—F.P.P.

EDITORIAL

Thesis Abstracts

Theses presented by senior and graduate students to fill requirements for degrees at universities are generally placed on the shelves of the university library, and as such libraries are usually open to quite general use, the theses become an available part of recorded information. Probably most doctor's theses in metallurgy get worked over into articles that are published sooner or later, though this may not always happen. Masters' and seniors' theses more commonly do not achieve publication.

Most of the latter class, because of limitations of time and the inexperience of their authors, are hardly worth being made over into articles, but may nevertheless contain nuggets of experimental information that would be helpful to others working in that field. But only local use can be made of such theses unless the metallurgical public, outside the university in which the work was done, is apprised of their existence.

We have pointed this out in past years and suggested that professors forward to METALS AND ALLOYS, on loan for abstracting, such theses of metallurgical interest as they feel do contain material worth abstracting and being called to attention. Some few theses have thus been received and abstracted, but not many professors bother about it.

The choosing of a thesis subject may be due to the professor's interest in it or it may mean that the student himself has a real urge to work on that topic. In the latter case there may well be employers into whose staff a man who had shown such an interest in a field of work on, or allied to, some of their own problems, would fit peculiarly well, so that such a man would prove a square peg in a square hole. Publication of an abstract of such a man's thesis might draw the attention of the potential employer to the potential employee, to their greater mutual advantage, than if the man took some other job or the job was given to a man without prior special interest in the field.

Since the professors may not bother to do so, we suggest that authors of such theses themselves arrange to have them sent on for abstracting.—H.W.G.

Manganese—A Strategic Material

At one of the recent monthly meetings of the New York Chapter of the American Society for Metals, the subject of "Strategic Materials" was discussed in an address by Col. C. T. Harris, Jr., director of the planning branch, office of the Assistant Secretary of War. The principal strategic metals reviewed by the speaker were: Manganese, nickel, chromium, tungsten, antimony and tin. A strategic material is one which, of course, is not produced in sufficient quantities within the borders of the United States to supply our needs under war conditions.

Most metallurgical engineers are familiar with the situation as to manganese. Colonel Harris pointed out that this is a highly strategic material—it is absolutely necessary in modern steel making, about 14 lbs. being used, on the average, in the production of every ton of steel. The principal sources of manganese as manganese ore are Russia, India, Brazil, and the Gold Coast of Africa, he said, but as to domestic supplies, in time of war when cost ceases to be the determining factor, it would be possible to stimulate output from American resources. The speaker reported that it is estimated that in two years of war, domestic production might supply approximately 30 per cent of our requirements—but at a very high cost. In any event, said the speaker, it would be necessary for us to secure from abroad at least 1,000,000 tons of ferro- or metallurgical-grade ore to meet a two-year demand—or our steel industry would be seriously handicapped. Domestic production in 1935 was only about 26,400 gross tons of ore while the imports for consumption were over 383,500 tons. Our present imports are very large—over 60,000 tons average per month late last year.

There have been and are strong advocates of a national policy of piling up a reserve of manganese ore to provide for an emergency. We believe this is essential but nothing yet has been done about it. Strong pressure should be brought to bear to obtain this supply as an insurance. In addition, metallurgical research should be concentrated on the development of some substitute for manganese in steel making. It seems, on the surface, an impossible task but its accomplishment is not unattainable. Problems almost equally difficult have been solved by metallurgists. However, that would take a lot of time.

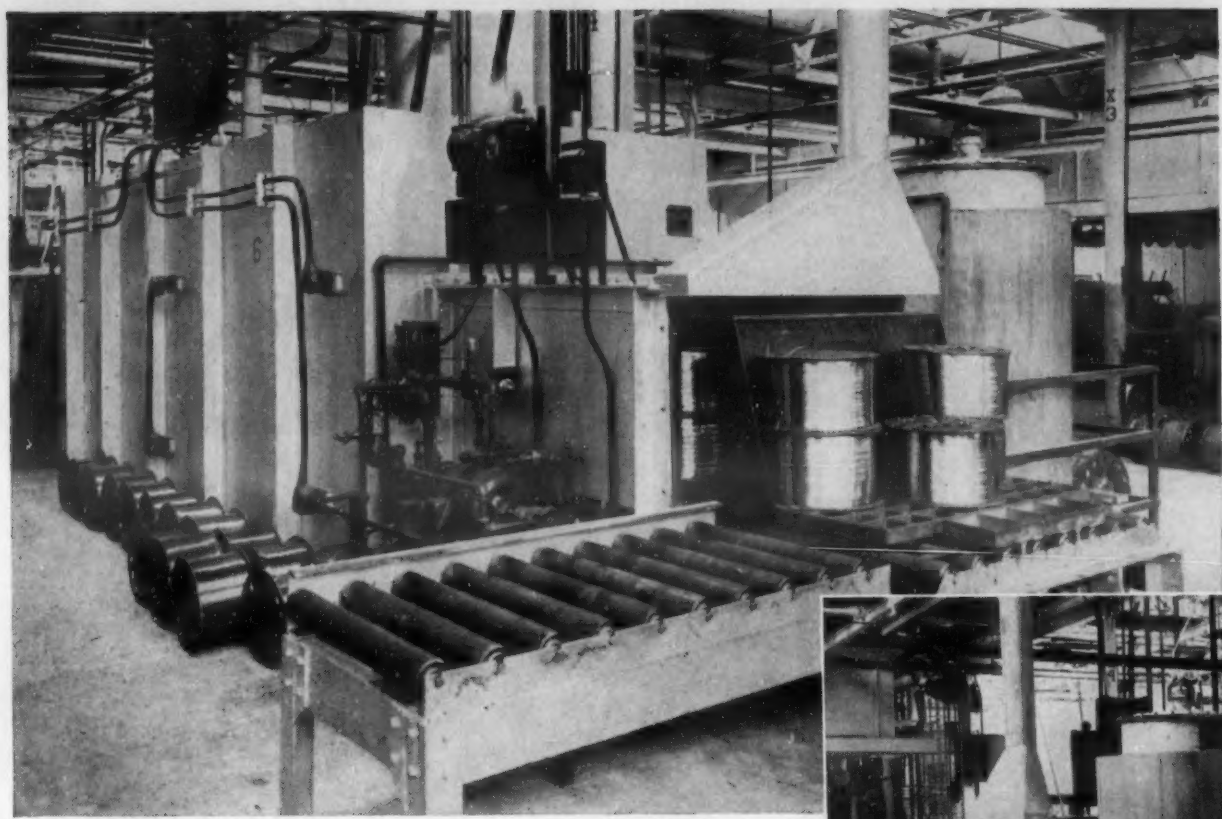
Moreover, a foreign war in which we were not involved, and we certainly don't intend to get involved in any, might greatly disturb the flow of manganese ore to neutrals and thus hamper our own steel industry and all that it means to other industries. A reserve supply of manganese that could be drawn upon for steel essential to general business, for rails, for instance, in a time of shortage would be a good economic balance wheel quite aside from the strategic war needs. Why not pay dividends in certificates of ownership of manganese ore stored at the steel plants, to be cashed when the ore is used, at the then value of the ore?

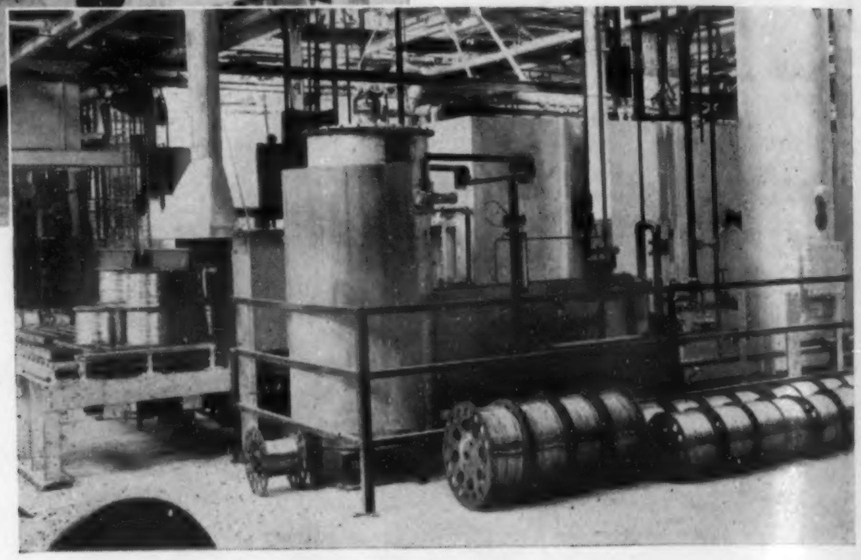
That a European war is in the making, unless dictators come to their senses, seems indisputable.—E.F.C.

Diesel Power—Past, Present and Future

Recently in New York the fortieth anniversary of the introduction of Diesel power in the United States was celebrated at a luncheon where a group of distinguished leaders in engineering, manufacturing and finance gathered. Progress in the application of Diesel power in recent years, it was emphasized, has been rapid. Today it drives the fastest trains in the world at the lowest cost, it generates electricity in many a central station, it takes the place of

(Continued on page 41)





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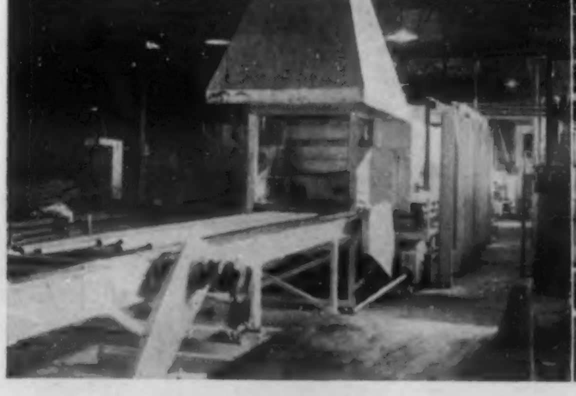
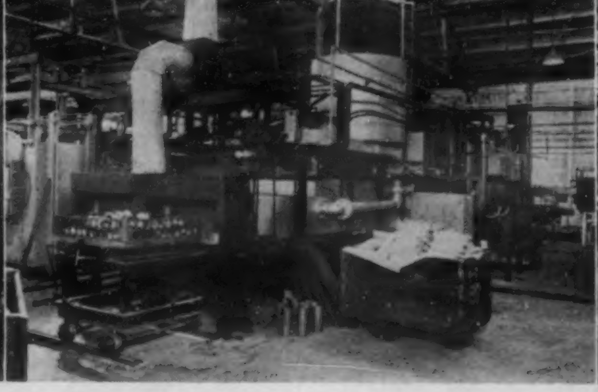
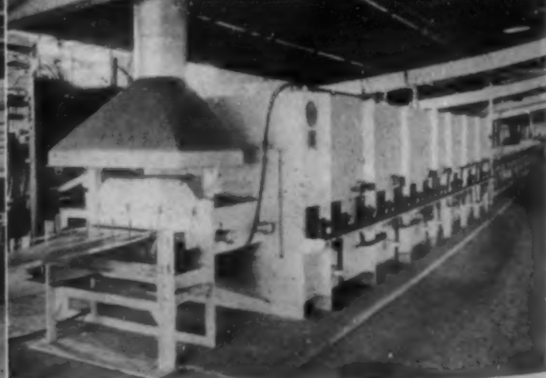


Bright Annealing Tubing—Continuously.



Bright Annealing Stampings—Continuously.



Bright Annealing Strip—Continuously.

CURRENT **Metallurgical Abstracts**

A DIGEST OF THE IMPORTANT METALLURGICAL DEVELOPMENTS OF THE WORLD

CLASSIFICATIONS

1. ORE CONCENTRATION

JOHN ATTWOOD, SECTION EDITOR

Abitibi. JOHN A. DRESSER. *Canadian Mining Journal,* Vol. 57, Oct. 1936, pages 463-466. A historical discussion of the Abitibi district in the province of Quebec. Surface features, the geology, and the occurrence of Au are included. A number of regional or general reports published by the Canadian Government are listed. WHB (1)

Siscoe Mining Practice. L. E. DJINGHEUZIAN. *Canadian Mining Journal,* Vol. 57, Oct. 1936, pages 494-509. Beneficiation of Siscoe ore is divided into three metallurgical stages: (1) sorting on the picking belt, (2) amalgamation, and (3) cyanidation. A well illustrated description of mining practice is given. WHB (1)

Hill 50 Treatment Plant. W. A. MADDERN. *Chemical Engineering & Mining Review,* Vol. 29, Oct. 8, 1936, pages 11-13. Hill 50 is located within 4 mi. of Mt. Magnet, W.A. A section and plan are given of the mill. Straking, classifying, cyaniding and filtering, and precipitation and disposal are discussed for this Au mining property. WHB (1)

1c. Flotation

Some Fundamentals of Flotation. KELVIN SPROULE. *Canadian Mining Journal,* Vol. 57, Nov. 1936, pages 582-588. 6 references. WHB (1c)

Factors Governing the Separation of Lead and Zinc in Ore by Flotation. R. A. PALLANCH. *Mining & Metallurgy,* Vol. 17, Aug. 1936, pages 386-389, 392. Considers only all-sulphide ores, with relatively minor degrees of oxidation. Discusses the testing of ores; segregation and mixing; feeding; mechanical classification; % of solids in flotation feeds; reagents and their control; Zn-pyrite rejection and Zn flotation in pyrite rejection. VSP (1c)

The Working of Enargite for Copper (Vorbehandlung von Enargit für die Kupferverhüttung) R. LIEBETANZ. *Metall und Erz,* Vol. 33, Mar. 1, 1936, pages 116-118. The chemical constitution of enargite (Cu_3AsS_4) is discussed at some length; and a process of extracting Cu therefrom, consisting of roasting the flotation concentrate and removing the As by treatment with strong alkali, is described. The ore cannot be used to produce sulphur as H_2SO_4, made from the latter, would contain a prohibitively high percentage of As FPP (1c)

1e. Amalgamation, Cyanidation & Leaching

Falling Velocities of Minerals through Water. W. MILLER & T. W. M'INALLY. *Iron & Coal Trades Review,* Vol. 133, Aug. 14, 1936, pages 258-259. The theory of Lunnon as applied to the problem of gravity separation of minerals is explained and the determination of the constants in Rayleigh's resistance formula for a body passing through a fluid described. The effect of shape of the particles on the fall is shown in curves. The tests to verify Lunnon's theory showed that under the author's conditions an average upward current necessary to suspend a particle is considerably greater than the velocity which the same particle would attain when falling freely in still water. Ha (1e)

Chromium in Cyanide Solutions. H. D. BELL. *Journal Chemical Metallurgical & Mining Society South Africa,* Vol. 36, June 1936, pages 385-392. An Eastern Transvaal Au mine obtained no Au precipitation with Zn dust due to the presence of chromates in the cyanide solution. A yellow precipitate formed on addition of $Pb(NO_3)_2$ was Pb chromate, carbonate, and hydrate; it did not contain Au but prevented Zn dust precipitation of Au in solution. To get normal Au recovery, all the Cr must be precipitated by addition of solution of Pb salt and the resulting precipitate removed prior to de-aeration. AHE (1e)

Gold Mining and Milling in the Black Mountains, Western Mohave County, Ariz. E. D. GARDNER. *United States Bureau of Mines, Information Circular No. 6901,* Sept. 1936, 59 pages. Operations at 8 mills are described. AHE (1e)

2. ORE REDUCTION

A. H. EMERY, SECTION EDITOR

2a. Non-Ferrous

Influence of $BaCl_2$, $CaCl_2$ and CaF_2 Additions on Current Efficiency During Magnesium Electrolysis. V. M. GUSKOV & Z. V. VASSILEV. *Metallurg,* Vol. 11, May 1936, pages 48-56. In Russian. 0.75% CaF_2 is sufficient in an equimolar mixture of $MgCl_2$ and KCl. CaF_2 content decreases during the run. $BaCl_2$ has a good influence while $CaCl_2$ has none. (2a)

Zinc from the Dust from the Throat of Iron Blast Furnaces (Versuche zur Gewinnung von Zink aus Gichtstaub von Eisenhochöfen) O. JOHANNSEN. *Angewandte Chemie,* Vol. 49, July 18, 1936, pages 478-480. Wet and dry methods for recovering Zn from blast furnace dusts and from slags are discussed. Extraction with ammoniacal $(NH_4)_2CO_3$ solution gives good results. Ha (2a)

2b. Ferrous

The Reduction of Iron Ores with Solid Carbon. A. E. DOBNER & ST. ŠKRAMOVSKY. *Iron & Steel Institute,* Sept. 1936, Advance Copy No. 10, 20 pages. Describes a stathmograph in which the ore and C are placed in a tube inside a furnace and the tube suspended by a quartz fiber from 1 arm of a balance. A mirror is fastened to the beam of the balance and the change in weight of the tube is recorded by shining a beam of light from the mirror onto sensitive paper. The apparent change in weight must be corrected for temperature change, and the apparent loss of C as determined by loss in weight must be corrected for small amount of H_2O and CO_2 in the ore-C mix and for oxidation by air. Results are reported for a roasted siderite known to be easily reducible and a Swedish magnetite, difficultly reducible in the blast furnace, both ground to 80 mesh. Curves obtained at 950 and 1050° C. show no obvious difference in the rates of reduction of the 2 ores due to the fine grain of the samples used. JLG (2b)

Bin Feeder and Screening Device. *Blast Furnace & Steel Plant,* Vol. 24, Aug. 1936, pages 693-695. Outlines developments in blast furnace stock handling and describes application of the Jeffrey-Traylor conveyer for ore-bin feeding. Conveyer operates by a combination of electromagnets and produces a reversible relative motion in 2 parts of system. Suspended element which contains magnets is free to move, as is also suspended conveyer plate over which stock is handled. Ore flows by gravity over sloping bin bottom onto conveyer plate. Adjustable gate for retarding feed is also used. Screen of loose hanging chains lying across front of advancing ore stream prevents flow of material after power is shut off. Feeder vibrates rapidly, moving ore and feeder plate forward and upward relatively to slope of latter and then jerking plate backward and downward from under ore. Amplitude of vibration is less than 1/8" and rapidity may be varied up to 3600/min. This device, applied to same width of opening, is as fast as the Hoover and Mason roller, somewhat easier to operate, capable of closer control, less seriously affected by variations in condition of ore, and much less expensive to install and maintain, and requires only 10% as much power. MS (2b)

Tamping the Base and Boshes of a Blast Furnace with Carbonaceous Material (Ausstampfen von Hochofengestell und Rast mit Kohlenstaffmasse) F. WEINGES. *Stahl und Eisen,* Vol. 56, July 23, 1936, pages 845-847. A mixture of ground coke and tar made very strong joints in repairing the refractories at the base and boshes of blast furnaces, preventing the breakout of metal and not being affected by shutdowns. SE (2b)

The Air-Blast in the Tuyere Zone (Ueber die Windannahme der Düsenstöcke) A. HOLSCHUH. *Stahl und Eisen,* Vol. 56, June 25, 1936, pages 725-728. The value of measurements of air pressure in the tuyere zone is brought out. A study was made of air distribution with different type burners and of the extent of the oxidation zone in the blast furnace. In 3 different type burners the oxidation zone reached to about the same height in the stack, but the width of the zone differed considerably. The amount of CO_2 formed varied with the gas speed. SE (2b)

3. MELTING, REFINING AND CASTING

Engineering and Its Relation to the Foundry. GEORGE W. ZABEL. *Journal Western Society of Engineers,* Vol. 41, Aug. 1936, pages 202-208. A paper purporting to show the foundryman's relation to engineering as displayed in the design of castings. Foundry casting losses, due primarily to design are classed as: (1) design not consistent with good foundry casting fundamentals, (2) complicated designs that necessitate special molding and core making equipment, and (3) designs which make cleaning costs high due to burnt-in sand, pockets, etc. Many losses due to metallurgical reasons, poor molding, bad cores, poor pattern making, etc., are not discussed. Some of the difficulties arising in the foundry are caused by gas formation in the cores. It is imperative when designing complicated castings that the engineer consult a competent foundryman. WHB (3)

Testing Molding Sands (Etat actuel des essais de contrôle des sables de moulage) WILLIAM G. REICHERT. *Revue de Métallurgie,* Vol. 33, Sept. 1936, pages 529-542. General description of methods used in the United States for testing foundry sands. JDG (3)

3a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

Recent Developments in the Production of Light Metal Castings (Die neuere Entwicklung bei der Herstellung von Leichtmetallguss) W. LINICUS. *Aluminium,* Vol. 18, Sept. 1936, pages 407-408. Recent improvements in castings of light metals are reviewed with respect to alloying, melting and casting methods. Sand casting is used mainly for limited quantities, and also for large and complicated pieces, up to 500 kg. Chill mold castings are preferably used for series production as this method assures fast work, uniform dimensions and surface quality. Chill molds are sometimes replaced by sand molds lined with quench plates fitting to the form. Die castings have been made up to 10 kg. and 70 x 50 x 20 cm. dimensions; the deviation from normal is only ±0.05 to 0.1 mm. Pure Al (of more than 99.5%) is selected for best chemical resistance. Mg and Mg-Si alloys can be hardened and are used for sea water resistance. Al-Cu, Al-Zn-Cu, Al-Zn-Ni and Al-Si-Cu have a lower chemical resistance but good mechanical and thermal properties. Silumin (Al with 12-13% Si) flows easily and can be hardened, and is useful for complicated castings. Examples for industrial and artistic purposes are given. Ha (3a)

Light Alloy Practice. Part I. Magnesium Alloys. Part II. Aluminum Alloys. H. G. WARRINGTON. *Metal Industry,* London, Vol. 48, Jan. 24, 1936, pages 136-140; Jan. 31, 1936, pages 160-166. A portion of a paper presented before the Midland Metallurgical Societies, Jan. 14, 1936. The author discusses Mg- and Al-alloys in both the cast and wrought condition. He attributes to the marked expansion in the aircraft and automobile industries the progress recently made in the production of high quality Mg- and Al-alloys. This is due to the increased efficiency and reliability gained by the reduction in weight and inertia losses from the use of designs which permit the increased application of these materials. HBG (3a)

Formation of Metals from their Ores by the Action of Solid Components on Each Other (Uber die Bildung von Metallen aus Erzen durch Einwirkung fester Stoffe aufeinander) CARL GOETZ. *Metall und Erz,* Vol. 33, May 1, 1936, pages 226-234. Solid phase reactions for the reduction of Cu pyrites, galena and sphalerite are described. The Cu pyrite is decomposed by heating to 600° and 800° C. with Fe oxide or Ca oxide in inert or reducing gases, the products of the reaction being Cu, Cu_2S and FeS. In the absence of the Fe oxide, a very small amount of metal may be reduced by heating in reducing atmosphere alone. Similar reactions occur with the Pb and Zn ores, and optimum conditions for greatest yield are specified. 19 photomicrographs illustrate the progress of the reaction with passage of time at several temperatures. FPP (3a)

The Application of Electric Heating Units to Soft Metal Melting. R. M. CHERRY. *General Electric Review,* Vol. 39, July 1936, pages 344-347. Construction of heating units, methods of installation, and advantages of immersion units are discussed. CBJ (3a)

Ferro-cerium (Le ferro-cerium). *Journal du Four Electrique,* Vol. 45, Aug. 1936, page 272. Ferro-cerium is produced almost exclusively in Austria, Germany and France as a spark generating alloy. It contains Ce with associated rare metals and 18-30% Fe. With less than 35% Ce the metal is useless for spark generation. Metal is melted under chlorides in a crucible not containing any carbon. Ce is melted first and Fe and sometimes Mg or Zn alloys added to the bath which is kept at 1100° C. Sb-Ce alloys produce excellent sparks but the alloy formation is so exothermic that it cannot be prepared commercially. Specific gravity of the alloys can be reduced by adding Al or Mg, but they tend to make the alloy brittle. A maximum of 12% Mg is permissible. Straight walled tubes are used for molds and they must be preheated to 800° C. Cooling must be very carefully and slowly conducted, because the cooling rate has a pronounced influence on the character of sparks. JDG (3a)

Deoxidation of Commercial Silver Alloys (Die Desoxydation der technischen Silberlegierungen) E. RAUB, H. KLAIBER & H. ROTERS. *Metallwirtschaft,* Vol. 15, Aug. 14, 1936, pages 765-770; Aug. 21, 1936, pages 785-788. The deoxidation of Ag-Cu alloy containing 83.5 weight % Ag was studied, showing that the degree of deoxidation is proportional to the difference between the heat of formation of cuprous oxide and of the oxide of the deoxidizer. Deoxidation is practically complete with Ca, Mg, Li, Be, Al and Mn, for which this difference exceeds 45 Calories per equivalent; while a measurable equilibrium is reached for Zn, P, Sn, and Cd, for which the difference is less than 45 Calories. The rate of deoxidation is proportional to the rate of diffusion of the deoxidant in the melt, and therefore inversely proportional to its melting point. Li and P are most satisfactory for commercial use. Li contents up to 1% have no detrimental effects on the mechanical properties of the alloy while Li decreases the corrosion in 5% HNO_3 by the formation of a passive film. Corrosion in hot acetic acid is not affected. Li is superior to P in that it gives almost complete deoxidation with the formation of Li_2O but this attacks the crucible more than the $CuPO_3$ formed with P. GD (3a)

Deoxidation and Degasification of Nickel-Silver Alloys. R. J. KEELEY. *Metal Industry,* London, Vol. 48, Feb. 21, 1936, pages 232-233. Paper was presented at the Third Annual Conference on Deoxidation and Degasification of Non-Ferrous Casting Alloys held at the Toronto Convention of the American Foundrymen's Association. See *Metals & Alloys,* Vol. 7, Sept. 1936, page MA 442R/1. HBG (3a)

Fundamentals of the Conversion of Old Metals to New (Uber die Grundlagen der Überführung von Alt- in Neumetall) E. J. KOHLMEYER. *Metallwirtschaft,* Vol. 15, July 17, 1936, pages 677-683. A general survey of the importance of reclaiming scrap metal is followed by a discussion of the methods which have proven most satisfactory. Proper grading, cleaning and sorting of the scrap not only simplifies the remainder of the process but increases the usefulness of the product. Melting and purification of Cu, Cu alloys, Al, Al alloys, Pb, Pb alloys, and Zn are discussed separately, with special consideration to fluxing materials. GD (3a)

3b. Ferrous

C. H. HERTY, SECTION EDITOR

Effect of Aluminum on Slag inclusions in 1.10% Carbon Steel. (Inverkan av aluminiumtillsats på slagginneslutningarna i kolstål av ca 1.10% kolhalt) KURT AMBERG & AXEL HULTGREN. *Jernkontorets Annaler,* Vol. 120, July 1936, pages 311-343. Steels made by different processes—crucible, acid open-hearth, acid and basic high frequency furnace—were examined in the ingot stage and after forging. The following results are reported: (1) In the high frequency furnace special care must be taken to prevent oxidation of Al when added during tapping into the ladle, or the consumption is increased and alumina inclusions will probably result. (2) Even with the best precautions some reduction occurs of SiO_2, MnO and FeO from the lining. (3) When Al is added after the molds are poured all the larger droplets of silicate rise to the surface and a more slag-free steel is obtained. (4) Reduction of the silicate droplets results in the formation of hard angular crystals insoluble in HF which are probably Al silicate (mullite or sillimanite). When Al is not added small spherical silicate inclusions not exceeding 10μ are often found in that part of the structure which solidifies last. (5) sulphide inclusions also appear to be affected by Al to form groups of inclusions with or without Al silicate. (6) Forging or rolling steel from which Al additions have been omitted causes plastic deformation of the spherical inclusions which may split or break if the deformation is too extreme. When Al is first added the Al oxide and silicate particles are deformed into streaks, but the separate particles maintain their shape. (7) As a general conclusion it is suggested that Al be added to the mold rather than the ladle. HCD (3b)

Internal Stress due to Cooling in Spherical Steel Ingots. TOKUTARÔ HIRONE. *Bulletin Institute of Physical & Chemical Research, Tokyo,* Vol. 15, May 1936, pages 243-253, in Japanese; *Scientific Papers & Abstracts Institute of Physical & Chemical Research, Tokyo,* Vol. 29, May 1936, page 19. In English. Formulas for the internal stress of spherical steel ingots during and after cooling have been proposed on the assumption that steel is elastico-viscous above a certain temperature, while it becomes perfectly rigid below that temperature. The calculations refer to Ni-Cr steel ingot of 40 cm. diameter. The following summarization is made: (1) When steel is assumed to become elastic above the $Ar_{3,1}$ transformation temperature, the internal stress in the center of the ingot acts always as tension, passing through a maximum just before the transformation. The stress distribution is greatly affected by the occurrence of the $Ar_{3,1}$ transformation. (2) When the temperature at which steel becomes rigid coincides with that of the transformation, the internal stress is considerably less than in case (1). In this case stress acts as compression in the central region of the ingot. (3) In both cases the tangential component of stress acts as compression at the peripheral portion of the ingot. See *Metals and Alloys,* Vol. 7, Jan. 1936, page MA4R/4. WH (3b)

The Castability of Cast Irons (La Coulabilité des Fontes) *La Fonderie Belge,* Vol. 3, May-June 1934, pages 74-79. This closing section of the important study of the Belgian Foundry Association on runability of cast Fe comprises 2 notes. The 1st from J. Léonard concludes that generally speaking the runability increases with rising Si content, but that the curve shows a 1st maximum for 0.3% Si, a 1st minimum for 0.5% Si, a 2d maximum for 0.7% Si and a second minimum for 1% Si. For higher Si contents, runability increases regularly. The second note from J. Challansonnet deals with experimental conditions of runability tests and reports results obtained by A. Courty (see *Revue de Metallurgie,* 1931, page 169) and explains that dynamic effects in the pouring jet have a great effect on the length of test bar. FR (3b)

Toughness of Cast Irons from Transverse Stress-Strain Curves. G. L. HARBACH. *Foundry Trade Journal,* Vol. 55, Aug. 20, 1936, pages 141-145. Paper presented on behalf of the Institute of British Foundrymen to the Association Technique de Fonderie. The author comes to the following conclusion: Cast irons have no definite elastic limit and therefore, there are no straight lines in the stress-strain curves. If the plastic and elastic components are separated, the elastic portions are practically straight lines and may be used to determine the E values. In general the E value for cast Fe increases with increasing strength. Practical experience of materials shows that toughness is associated with certain characteristics in the stress-strain curves and when similar characteristics are produced by cast irons they are also associated with good toughness. Cast irons having a low proportion of plastic set are brittle whereas those having a high proportion tend to be tough. Irons in which the major portion of plastic set occurs near the breaking load are tougher than irons of otherwise similar strengths and deflections. Ni-Resist cast irons have a greater proportion of plastic set than ordinary cast irons and are invariably more difficult to break. It may be accepted that a good capacity for plastic deformation coupled with other favorable factors, offsets the effect of comparatively low strength and that toughness is not necessarily related to strength. AIK (3b)

Solidification and Crystallization of a Steel Ingot. A. K. JHEGALOV. *Metallurg,* Vol. 11, Aug. 1936, pages 16-26. In Russian. Temperature of cooling ingots was determined by C-W couples properly protected and placed in different parts of ingots. Large temperature differences and continuous change in crystallization conditions which could be checked by changes in thermal conductivity, thermal capacity, temperature gradient, etc., support the theory that crystallization takes place in stages. Its linear and volumetric speed, which change periodically, were determined experimentally. Cooling speeds of different portions of ingots were determined by the study of cooling curves. Jhegalov alleges that with the exception of the outside skin the center of ingot cools the fastest. A scheme for determining heat conductivity of steel at high temperatures was proposed on the basis of Newton's law of cooling of bodies and distribution of temperature in ingots which was determined experimentally. (3b)

Porosity, Reducibility and Size Preparation of Iron Ores. T. L. JOSEPH. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 120, *Iron & Steel Division,* 1936, pages 72-98. Includes discussion. See *Metals and Alloys,* Vol. 7, May 1936, page MA 230L/1. (3b)

The Founding of Pressure Castings. H. H. JUDSON. *Foundry Trade Journal,* Vol. 55, July 2, 1936, pages 3-8; *Foundry,* Vol. 64, Aug. 1936, pages 30-31, 69-70; Sept. 1936, pages 28-30, 79. American exchange paper presented at the Annual Conference of the Institute of British Foundrymen in Scotland. It deals solely with pump castings. 2 types of mixtures, the 1 and 2-cupola process, materials used, high- and low-temperature experiments, risers, chills and chaplets, pouring temperatures and pouring practice, soft Fe, combating internal defects, control of chill depth, etc., are discussed. In the 2-cupola process two cupolas, one with a 54" bore and the other with a 72" inside diameter, are used to produce a high duty iron. The 72" cupola melts the Fe containing: T.C, 3.25; Si, 2.40; Mn, 0.55; S, 010, and P, 0.35%. A predetermined amount of this soft mixture is run into a crane ladle, suspended from a crane scale and is then poured into the ladle containing the hard iron from the 54" cupola. The resulting analysis of this mixture is roughly as follows: T.C, 2.50-2.65; Si, 1.50-1.70; Mn, 0.90-1.10; S, 0.11-0.13, and P, 0.15%. This Fe is used for castings that operate at pressures up to 1500 lbs./in.^{2} on oil and petrol, and which are tested up to 3500 lbs./in.^{2} These castings weigh from 500 to 3000 lbs. It is concluded by the author that for castings to withstand internal pressures, the most important element in cast Fe is C. Decreasing the total C content below the percentages usually encountered in high duty irons, the means by which it is decreased and the hot-pouring of these lower C irons make for a finer-grained structure. This refining of the grain-size provides both pressure-tightness and increased strength. AIK + VSP (3b)

Some Factors Affecting Life of Ingot Molds. W. J. REAGAN. *Metals Technology,* Sept. 1936, *American Institute Mining & Metallurgical Engineers Technical Publication* No. 745, 12 pages. Reports observations on life of molds used in bottom casting basic open-hearth steel containing between 0.50 and 0.85% C. The molds were fluted and failure usually occurred by fire cracking on the flats near the bottom. The factors that influenced mold life seemed to be: (1) wall thickness or mold weight, and (2) chemical analysis of the mold metal, particularly Mn. Mn of approximately 1.50% with Si of about 1.60% seems to give the maximum mold life. Si content of over 1.60% results in shortening of the mold life. JLG (3b)

Conditions Leading to Production of Unhardened Surface of Articles Cast in Chills. N. P. DUBININ. *Liteinoe Delo,* Vol. 7, No. 6, 1936, pages 31-36. In Russian. Rods of irons having different compositions and diameters varying from 10 to 50 mm. were cast in chills. Structure and hardness determinations indicated that production of chilled skin is prevented by a proper content of Si + C. There was no direct relation between the diameter of castings and C + Si content. All means leading to reduced heat transfer between the walls of chills and the metal tend to affect favorably the softness of castings. (3b)

Cost of Complicated Pipe Casting Reduced by Skeleton Patterns. J. H. EASTHAM. *Iron Age,* Vol. 138, Aug. 20, 1936, pages 38-39, 61. Describes method used in casting a marine engine discharge pipe 16 in. in diam., 10 ft. long and weighing approximately 1500 lb. Instead of highly finished full pattern and core boxes, a skeleton arrangement in coreroom and on molding floor was used. Molds were of green sand type gated along the joint. Cost was half of that estimated for full pattern. VSP (3b)

Molding Steel Turbine Casings. H. V. FELL. *Foundry,* Vol. 64, June 1936, pages 28-31, 88; July, pages 30-32, 72. Well illustrated and detailed description of the methods pursued in making the mold and cores for a large steel turbine casing in a prominent British foundry. In July issue, covers the subsequent operations in closing the mold, pouring the metal, stripping and annealing the casting. Also gives alternative methods for molding the casting in opposite or joint up position. VSP (3b)

Manufacture and Application of Modern Cast Irons. *Foundry Trade Journal,* Vol. 54, Mar. 5, 1936, pages 191-193. Extended abstract of the paper read by J. W. Gardom before the Manchester Association of Engineers. In connection with rotary melting furnaces it was pointed out that they are now available fired by pulverized fuel, oil or gas. The Brackelsberg furnace barrel is now made symmetrical at both ends, so that if excessive wear occurs at one end, the barrel can be lifted out and reversed end for end. This considerably increases lining life. The principal advantage of the rotary furnace for the production of high-duty irons is the close metallurgical control. Acid linings are employed so that P and S remain unchanged. C can, however, be controlled within $\pm 0.05\%$, through the range 0.3 to 3.5%, and Si and Mn can be controlled within the same close limits. Further advantages are the high metal temperature (up to 1600° C.) and low production costs due to use of cheaper raw materials. A survey was made of the metallurgical control of material, in which the influence of P on soundness was stressed. AIK (3b)

Gate Design for Iron Castings. N. YA. GRJHIBOVSKI. *Liteinoe Delo,* Vol. 7, No. 6, 1936, pages 15-17. In Russian. Amount of metal passing through a gate is a function of the head of metal and cross section of gates. The latter can be determined from the formula $\rho = \dfrac{G}{mt}$ cm.^{2} where G is the weight of metal, t time of casting, ρ total cross section of gates and m is the amount of metal passing through a square centimeter of gate cross section in second under a given heat. Some values for m for heads from 100 to 1500 mm. are given. Several practical examples are given. (3b)

Carbon in Pig Iron. WILLIAM E. BREWSTER. *Metals Technology,* June 1936, *American Institute Mining & Metalurgical Engineers Technical Publication* No. 716, 13 pages; *Transactions American Institute Mining & Metallurgical Engineers,* Vol. 120, *Iron & Steel Division,* 1936, pages 134-154. Deals with reconciliation of the higher total C content of pig Fe made in a modern furnace compared with Fe otherwise of the same analysis made in other furnaces, the same coke, ores, and limestone being used. 2 outstanding differences are shown between the furnace producing Fe high in C and the other furnaces; first, the use of higher blast heats, and second, the more nearly continuous application of blast effected through the use of an automatic clay gun, making it unnecessary to take the blast off at cast. A comparison of Fe made over a range of 400° F. blast temperature failed to show any consistent difference in total C content as related to blast temperature. A study of the data disclosed 1 outstanding fact: the quantity of C necessary to reduce an ore to Fe by indirect reduction in the furnace producing Fe of high C was in each instance greater than the C available at the tuyeres, which necessitated some direct reduction. This was not the case with other furnaces. Owing to the necessity of supplying sufficient heat to carry on direct reduction, the hearth temperature continuously maintained made possible a greater concentration of C than is possible when the hearth temperature is affected by dropping of the stock column, which occurs when the blast is taken off the furnace to stop the Fe notch or for any other reason. JLG (3b)

The Influence of Deoxidation on the Aging of Mild Steels. B. N. DANILOFF, R. F. MEHL & C. H. HERTY, JR. *Transactions American Society for Metals,* Vol. 24, Sept. 1936, pages 595-639. Paper presented and discussed at Chicago Convention of the
1 Society, 1935. See extended abstract, *Metals and Alloys,* Vol. 6, Mar. 1936, pages 71-77. WLC (3b)

The Manufacture of Intricate Thin-Walled Steel Castings. R. HUNTER & J. MCARTHUR. *Foundry Trade Journal,* Vol. 55, July 23, 1936, pages 62-65; July 30, 1936, pages 77-80. Paper read at the Annual conference of the Institute of British Foundrymen. Maintenance of size, prevention of hot tears, gating of the casting, choice of molding method, horizontal turbine pump fram-
2 ing, vertical turbine pump framing, gear case, Diesel engine crankcase, etc., are discussed. The first section of paper deals with the various phases of steel foundry practice, with particular reference to thin walled steel castings. The second part is devoted to the description of the actual manufacture of some typical castings. AIK (3b)

A Study of the Influence of Manganese and Molybdenum Additions to Cast Iron. J. E. HURST. *Foundry Trade Journal,*
3 Vol. 55, July 16, 1936, pages 39-42; July 23, 1936, pages 66-70. Paper presented at the annual conference of the Institute of British Foundrymen. Increasing quantities of Mo additions tend to produce white fracture and with very low Mn content (0.25%) an addition of 1% Mo was required to ensure a white fracture under the conditions of the experiments. In the presence of small amounts of Mn the effect of increasing the Mo content on the Brinell hardness is not very great until a percentage of approximately 0.70 % of this element is attained. Increase in the Mn
4 content brings about a general increase in the hardness and extremely high hardness values of 600 Brinell and over are obtained with Mn and Mo in excess of 2.25% and 1.00% respectively. The annealing treatment adopted in the experiments had the effect of spheroidising the pearlitic-martensitic matrices and in the more highly martensitic alloys a constituent of troostitic character appears. In these same alloys the carbide constituent appears to be very stable and it was difficult to observe any such reduction in quantity of this as appeared in the lower Mn-Mo content speci-
5 mens. The author believes that this observation has a bearing probably on the substantially high hardness values maintained after annealing in the higher Mn-Mo specimens. AIK (3b)

Gray Cast Iron Cast Under Pressure In Metal Molds. A. M. HOFFMAN. *Compressed Air Magazine,* Vol. 41, Sept. 1936, pages 5124-5125. Die castings of cast iron are produced under air pressure. A die casting machine of 400 lb. capacity is described. The process is suited for production of simple castings.
6 HMW (3b)

Behavior of Melts of Iron, Nickel and Manganese towards their Liquid Silicates and Solid Silica at 1600° C. (Das Verhalten der Schmelzen von Eisen, Nickel und Mangan gegen ihre flüssigen Silikate und feste Kieselsäure bei 1600°) W. OELSEN & G. KREMER. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Düsseldorf, Vol. 18, No. 8, 1936, pages 89-108. Tests were made to determine whether the equilibria of reactions
7 between Fe, Mn and Si and their oxides are changed materially if alloying elements are added which do not form pronounced compounds with the Fe and Mn in the metal layer of the melt; for this reason the 3 phase equilibria: metal layer—silicate slag—solid SiO_2, as investigated in the system Fe-Ni-Mn-Si-O in which the reactions occur:

(1) $Mn + FeO \rightleftarrows MnO + Fe$
(2) $Si + 2FeO \rightleftarrows SiO_2 + 2Fe$
8 (3) $Si + 2MnO \rightleftarrows SiO_2 + 2Mn$
(4) $Fe + NiO \rightleftarrows FeO + Ni$
(5) $Si + 2NiO \rightleftarrows SiO_2 + 2Ni$
(6) $Mn + NiO \rightleftarrows MnO + Ni$

The equilibria were found to be, for Mn and Si contents below 1% of the metal layer, largely dependent on the Fe and Ni contents so that the changes of the small Mn and Si contents effect much greater changes in the composition of the equilibrium slag than the varying Fe and Ni contents. The conditions are ex-
9 plained at great length by the tests. 15 references. Ha (3b)

A New Spun Pipe Casting Plant. *Engineer,* Vol. 161, June 19, 1936, pages 656-657; *Engineering,* Vol. 141, June 19, pages 663-664. Describes plant and method of Ormesby Iron Works of Cochrane's Foundry, Ltd. Process is the outcome of the Mairy ferrosilicon and the Delavaud centrifugal pipe casting methods. Mairy process consists of applying a thin coating of ferro-silicon to revolving steel mold before metal is introduced. Deposition acts
10 as an insulator on mold and prevents formation of chill. Metal of pipe cast in this way has a dense structure peculiar to combined Delavaud and Mairy processes. Increased ductility and resistance to shock are added to the high tensile strength of Delavaud pipe. VSP (3b)

4. WORKING

Hot Milling of Rock-drill Bits at the Mines of the Vinegar Hill Zinc Co., Platteville, Wisc. WING G. AGNEW. *United States Bureau of Mines, Information Circular* No. 6907, Oct. 1936, 2 pages. Descriptive. AHE (4)

4a. Rolling

S. EPSTEIN, SECTION EDITOR

Measuring Rolling Work with a Carbon Resistor Element (Messen der Walzarbeit mit einer Kohle—Druckmessdose) W. LUEG. *Stahl und Eisen,* Vol. 56, July 2, 1936, pages 766-768. The torque required to turn the rolls was measured by means of the carbon resistor element attached to the spindle transmitting the power to the rolls. In cold rolls the friction between the work and rolls was readily measured in this way. SE (4a)

Recent Innovation in Rolling Mills at Ford Motor Co. M. STONE. *Iron & Steel Engineer,* Vol. 13, Oct. 1936, pages 15-18. Descriptive. See *Metals and Alloys,* Vol. 7, Mar. 1936, page MA 116L/3. WLC (4a)

Rolling Strip Steel at the Inland Steel Company's Plant. WILFRED SYKES. *Mining and Metallurgy,* Vol. 17, Oct. 1936, pages 471-473. From a paper read before the Chicago sections of the A.I.M.E. After giving briefly the development of the rolling of strip steel, describes the 4-high rolling mill of the Inland Steel Co. and outlines procedure in rolling. VSP (4a)

Application of Photoelectric Pyrometer to Bethlehem Shape Mills. A. J. STANDING. *Iron Age,* Vol. 138, Nov. 19, 1936, pages 49-50, 61. Describes photoelectric pyrometer used on a 48" shape mill in the Saucon plant of Bethlehem Steel Co. Operating results have been successful and improved mill yield resulting from accuracy of section rolled has justified the application. VSP (4a)

Blooming Mill Modernization for Better Quality Requirements. T. C. CAMPBELL. *Iron Age,* Vol. 138, July 16, 1936, pages 53-55, 87-89. Describes the new electrically driven 44" 2-high reversing rolling mill of the Jones & Laughlin Steel Co. The equipment was made by the Mackintosh-Hemphill Co. VSP (4a)

Alloy Tubes for Aeroplanes. GILBERT EVANS. *Aircraft Engineering,* Vol. 8, Aug. 1936, pages 224-226. General review of English practice in manufacturing by rotary piercing mill and extrusion press. WB (4a)

Important Trends in Rolling Methods. J. R. MILLER. *Blast Furnace & Steel Plant,* Vol. 24, June 1936, page 540; July 1936, page 630. Two important changes in methods of manufacturing steel products are improvement in methods and equipment for producing sheets and black-plate and electrical welding of pipes and tubes. In the former, the continuous wide strip mill is the most important development. Versatility in applications of strip is leading to its supplanting products of other mills, which will result in early obsolescence of certain sizes and types of plate, skelp, and structural mills. More liberal rates of depreciation than formerly had been allowed should be the rule in the future. MS (4a)

Tension Control in Cold Strip Rolling. F. MOHLER. *Iron & Steel Engineer,* Vol. 13, Oct. 1936, pages 19-27. Describes devices for control of the tension in cold strip rolling. These devices make possible the study of the effect of tension on the production and properties of cold rolled strip steel. WLC (4a)

Facts Versus Theory in Rolling Mill Practice. W. H. MELANEY. *Blast Furnace and Steel Plant,* Vol. 24, May 1936, pages 416-418, 442-444. Reply to Sobolensky's criticism *(Blast Furnace & Steel Plant,* Vol. 24, Mar. 1936, pages 236-238, 252; Apr. 1936, pages 313-314, 331) of author's theory of elastic restoration of metal being rolled *(Metals and Alloys,* Vol. 4, Apr. 1933, page MA 123). States that in actual rolling-mill practice many of the conditions surmised by former do not occur. Contends that theory of elastic restoration accounts for what does take place. MS (4a)

Blisters on "Alplat" Sheets. I. T. KOLENOV. *Metallurg,* Vol. 11, May 1936, pages 91-94. In Russian. Description of a short experimental series connected with preparation of "alplat" (alclad) Al. The number of possible blisters is reduced somewhat when a heavy reduction is accomplished in the first pass. (4a)

Clean Water Leads to Plant Savings. *Blast Furnace & Steel Plant,* Vol. 24, July 1936, page 590. **Strainer for Continuous Strip Mill Descaling System Is Self-Cleaning.** *Steel,* Vol. 99, July 6, 1936, page 54. Automatic strainer consists essentially of a conical cylinder revolving in a cast Fe housing. H_2O passes through glazed perforated porcelain straining disks held in the slowly revolving cylinder. About 5% of cleaned H_2O reverses its flow and jets from within cylinder through screening media, passing to a waste compartment which drains separately from main discharge. MS (4a)

Converting Universal Plate Mill for Hot Strip. *Iron Age,* Vol. 138, Nov. 26, 1936, pages 39-40. Describes the converted 2-high single stand universal plate mill for rolling hot strip for tin plate, in addition to producing universal and sheared plates, of the Dominion Foundries and Steel Ltd., Hamilton, Ontario. By adding equipment it was converted into Steckel reversing hot strip mill. Tonnage runs from 125,000-175,000 tons annually. With the new setup slab ingots 14 to 16" thick, about 48" long and in various widths are rolled in a series of passes down to 12 gage. Large slab ingots may be rolled into strips without any reheating, and use of blooming mill is eliminated. For cold reducing single-stand reversing mill is used producing strips up to 22" wide. VSP (4a)

Avoiding Surface Defects in Rolling Hexagons (Die Vermeidung von Oberflächenfehlern beim Walzen von Sechskanstaben) H. CRAMER. *Stahl und Eisen,* Vol. 56, July 9, 1936, pages 785-790. To eliminate or avoid rolling seams on the unsupported surfaces the work should be rolled hot with short soaking in the furnace. Roll designs to avoid seams are also recommended. SE (4a)

New Strip and Skelp Mill (Neues Bandstahl- und Röhrenstreifen-Walzwerk) B. BURDEWICK & T. SODA. *Stahl und Eisen,* Vol. 56, June 18, 1936, pages 708-711. The layout of the mill, methods of rolling, and output are discussed. SE (4a)

Present-day Problems of the Rolling Mill Industry. ALBERT NÖLL. *Iron & Steel Institute,* Sept. 1936, Advance Copy No. 3, 29 pages. Describes several mills used in the German steel industry. Among the subjects discussed are small-section and rod mills, strip mills, rolling mills for wide strip, improvements in working of old sheet mills, production of wide and heavy sheets, and tube production. JLG (4a)

4b. Forging & Extruding

A. W. DEMMLER, SECTION EDITOR

Press Forging of Brass. *Heat Treating & Forging,* Vol. 22, July 1936, pages 327-328. Deals with advantages of die pressings over sand castings. Die pressings can be forged into complicated shapes, have much greater density and higher strength and elasticity, are economical to use and uniform in size and shape, require little machining, can be finished at higher speed, and increase tool life 4-6 times; they are gas, air, and H_2O tight, and can be furnished in a wide variety of brass, bronze, and white metal alloys. They are used extensively. MS (4b)

Drop Forged Manhole Covers. *Iron Age,* Vol. 138, Sept. 24, 1936, pages 37, 90. Describes drop forged manhole covers made by the Steel Improvement & Forge Co. The covers are designed to withstand present-day maximum boiler pressures. Cost of making them compares favorably with that of steel stampings. Entire manhole cover is a single forging, bolt bases being forged integral with body. Yokes are formed in T-shape to provide maximum strength and prevent distortion under heavy stress. Cites advantages. VSP (4b)

Perhaps a Forging Is Required. S. L. STEVENSON. *Heat Treating & Forging,* Vol. 22, Aug. 1936, pages 383-385. Discusses forgings and their applications from the point of view of a design engineer. MS (4b)

Preparation of Drop Forging Dies for Use in Cutlery Manufacture. FRED B. JACOBS. *Steel,* Vol. 99, Sept. 7, 1936, pages 42-45. Describes and illustrates processes followed at the plant of Claus Shear Co., Fremont, O., in sinking dies used in the manufacture of shears and scissors. MS (4b)

4c. Cold Working — Shearing, Punching, Drawing & Stamping

Power for Cascade Drawing of Copper. P. M. Mueller. *Wire & Wire Products,* Vol. 11, Oct. 1936, pages 503-505. Graphs and curves were developed from practical tests to calculate power required. Ha (4c)

Experiments on Autofrettage. P. Martin. *Memorial de l'Artillerie Francais,* Vol. 15, Part I, 1936, pages 3-30. Experiments were conducted to check theories of the cold working of thick hollow steel cylinders. Details of macro and micro structures of the deformed metal are given in an appendix by A. Ourbak. DJM (4c)

Plastic Deformation in Wire Drawing. B. L. McCarthy. *Wire & Wire Products,* Vol. 11, Oct. 1936, pages 493-501. Phenomena occurring when a metal is cold worked are explained by the example of drawing of steel wire. The slip interference theory of Jeffries and Archer is considered to give the most adequate explanation of the hardening of metals as result of cold working. Wire is drawn from 2 types of metals: (1) pure metals and solid solutions, the latter best exemplified by Cr-Ni steels, Cu-Zn alloys and the ferrite commercial steels; (2) aggregates, exemplified by steel containing Fe carbide in the form of free cementite or combined with ferrite to form pearlite, and by Cu containing Cu oxide. Areas which are strained in the drawing process beyond the limit of atomic cohesion will produce internal fractures so that the wire is brittle. The more uniform the metal is with regard to hardness, the faster the deformation can be. Cuppy wire is the result of internal fractures and usually can be traced to segregation of elements at the axis of the wire. 6 references. Ha (4c)

Comparisons of the Deformations Obtained by Hydraulic Pressure and by the Action of the Gases from Explosives in Cylindrical Tubes. G. Menard. *Memorial de l'Artillerie Francaise,* Vol. 15, Part I, 1936, pages 31-53. Experiments with bombs indicated that steel deformed by hydraulic pressure did not further deform under the action of explosive gases until the pressure was equal to, or exceeded by, the pressure of the explosive gases. Experiments conducted with cylindrical tubes confirmed these observations. DJM (4c)

Advances in Sheet Steel of Prime Importance. A Summary of Important A.S.M. Articles. *Metal Progress,* Vol. 30, Oct. 1936, pages 117-123. Characteristics of deep drawing automotive sheets are discussed; also continuous rolling practice, annealing, aging, stabilizing and cold work hardening. WLC (4c)

4d. Machining

H. W. GRAHAM, SECTION EDITOR

Quality Inspection of Free-Machining Steel during Cold Drawing (Güteüberwachung des Automatenstahles in der Zieherei) F. Bousmann & M. Komers. *Stahl und Eisen,* Vol. 56, Aug. 20, 1936, pages 952-955. The tensile properties of free-machining steel after various degrees of cold drawing give some indication of the quality. After drawing the machinability is determined by actual cutting tests. Notched-bar bend tests, grain size determinations, and hardenability tests after carburizing are also made. Since free machining steel is generally reduced by cold drawing from 1 to 2 mm. regardless of the cross-section, the tensile strength as supplied generally varies with the cross-section. Long time tempering at 400° C. after the drawing improves machinability. SE (4d)

Testing the Machinability of Screwstock (Prüfung der Automatenstähle auf ihre Zerspanbarkeit) F. Rapatz. *Stahl und Eisen,* Vol. 56, May 28, 1936, pages 617-622. A machinability test should determine the practical allowable cutting speed and the surface obtained. Short-time machinability tests such as measuring the cutting pressure, the temperature rise in cutting, and the dulling of the tool and chip with increasing cutting speed, are discussed. In turning in a lathe these tests do not correlate well with results in practice but this may be due as much to variations in practical cutting conditions as to shortcomings in the tests. For drilling and threading similar correlations are not yet complete. Measurements of the surface appearance by showing profiles of the grooves have proved practical. Screwstocks which can be cut at high cutting speeds give good surface. However, harder steels which must be cut at slower speeds also give very good surface. SE (4d)

Requirements of the User of Free Machining Steel (Anforderungen der Verbraucher an die Automatenstähle) W. Pagel. *Stahl und Eisen,* Vol. 56, July 30, 1936, pages 861-863. In rimmed free machining steel of medium cross-section the user desires a minimum cutting speed of 65 m./min. in turning; in unrimmed steel 50 m./min. He wants short brittle chips, smooth surface, little tool wear, long tool life, fine uniformly sized MnS inclusions, no grain boundary cementite, no cold shortness, no critical grain growth, and no longitudinal or transverse cracks. The tensile strength of cold drawn free machining steel should be from 68,000-100,000 lbs./in.^{2} with 14-6% El, and 45-35% R.A. It should be possible to weld or rivet the steel. SE (4d)

Properties of Free Machining Steels (Eigenschaften der Automatenstähle) K. Stein. *Stahl und Eisen,* Vol. 56, Sept. 3, 1936, pages 993-1000. American and German free-machining steels have similar tensile and impact properties. Standardization of German free machining steels is difficult since there is no short-time machinability test that gives reliable and reproducible results. Composition and properties of various free machining steels are given. SE (4d)

Machinability Tests with Various Deoxidized Screw Steels (Zerspanbarkeitsversuche mit verschieden beruhigten Automatenstählen) O. Weidtmann. *Stahl und Eisen,* Vol. 56, July 9, 1936, pages 790-795. Screwsteels deoxidized with Al, Cr, Si, Mn, Ti, V, and Zr in the ladle were studied. The steel deoxidized with Mn worked best in turning and drilling tests. Next came the steel with 0.62% Cr. The steels with Si, Zr, Al, V, and Ti decreased in machinability in turning in the order given. The order of decrease for drilling was V, Zr, Ti, Si, Al. SE (4d)

Cutting Media. E. E. Halls. *The Industrial Chemist,* Vol. 12, Aug. 1936, pages 377-381; Sept. 1936, pages 403-406. Brief presentation of the mechanism of cutting, methods of testing and selection of soluble oils is given and the comparative properties of cutting oils, with special reference to modern sulphurized oils are discussed. RAW (4d)

Lathe Cutting of Monel Metal. Melvin Matsen. *Iron Age,* Vol. 138, Sept. 10, 1936, pages 34-39. Includes 3 references. Claims that so far as is known, nothing having a direct experimental basis has been published on the relations between cutting speed, tool life and shape, depth of cut and feed when machining Monel metal. Tool bits used in experiments were of high speed steel of 18-4-1 type 5/8" square. Tool life was determined by close observation of cutting edge of tool during test. Depth of cut of 3/16" was used with feeds of 0.0033", 0.0132" and 0.0284". Tabulates results of tests run at above mentioned speeds. Derives mathematical formula for the relationship between cutting speed and tool life. Includes numerous tables and graphs giving results of tests. These tests were conducted in cooperation with American Society of Mechanical Engineers, sub-committee on metal cutting. VSP (4d)

Modernization brings a Tool Holder Revaluation. Edwin L. Cady. *Mill & Factory,* Vol. 19, Aug. 1936, pages 57-59, 124. Because tool holders lend themselves to the increased versatility and number of modern metal-cutting operations, their use has increased tremendously in recent months. The usefulness of the latest types of machine tools is greatly enhanced thereby, and the disadvantages of old, worn machines are lessened. Metal cutting operations have increased also, because of the development of harder cutting materials such as W and Ta carbide. Several types of available tool holders are described, and illustrated, and their applications discussed in detail. FPP (4d)

Pneumatic Clamps Hold Work on Huge Planing Machine. *Compressed Air Magazine,* Vol. 41, May 1936, page 5040. 24 pneumatic clamps or hold-downs are a feature of 2 huge planers at the U. S. Navy Yard in Philadelphia. The machines, designed to handle the government's heat-treated armor plate, are each 60 feet long, 16½ ft. high and weigh 105 tons. Plates ranging in length from 6 to 36 feet and up to 5" thick can be cut, scarfed or beveled. Despite its ponderous size, the machine is accurate to .001". FPP (4d)

Influence of Structure on Chip Formation and Machined Surface in High Speed Machining Alloys, especially Aluminum Alloys (Einfluss des Gefüges auf Spanzildung und Schnittfläche bei "Automatenlegierunger," insbes. bei Aluminiumlegierungen) E. Vaders. *Metallwirtschaft,* Vol. 15, Aug. 28, 1936, pages 814-817. A general discussion of the problem showing that for high speed machining the form of cutting as well as the surface is important. Most satisfactory materials have a disperse phase which is softer than the bulk of the material. Al alloys have been developed which compare favorably with special brasses. GD (4d)

5. HEAT TREATMENT

1

O. E. HARDER, SECTION EDITOR

Apprentice School Heat Treating at the Cincinnati Milling Machine Company. JOHN GATCH & H. J. DODS. *Heat Treating & Forging,* Vol. 22, Sept. 1936, pages 471-472. Equipment in heat-treating department of training school consists of 2 hardening furnaces, a horizontal drawing and tempering furnace, a cyanide pot, a Pb pot, a 30-lb. solder pot, a forge, temperature control and 2 recording apparatus, and hardness testing-machines. Tools used in main shop and some production jobs are hardened here, majority of jobs being tools. Students do all the work of the department under strict supervision of heat-treating instructor. They perform all the different operations in the following order: forging, cyanide hardening, Pb-pot work, tool hardening, tempering, straightening, and inspecting. Training period is 8 45-hr. weeks. MS (5)

3

Heat Treatment of Gray Cast Iron (Les Tratiements Thermiques de la Fonte Grise) GEORGES DELBART. *Bulletin de l'Association Technique de Fonderie,* Vol. 10, May 1936, pages 166-172. Paper presented at the Foundry Congress in Lille, June 1936. Thermal treatment of metal in both the liquid and solid states considered. Superheating molten cast Fe gives a finer grain and stronger metal. The bad effects of superheating may be avoided by working in a reducing atmosphere and with proper slag covers. Various heat treatments for plain and alloy cast irons are given. 4 14 references. WHS (5)

The Effect of Various Heat Treatments on Copper Steels (L'Influence de Divers Traitements Thermiques sur les Aciers au Cuivre) *Cuivre et Laiton,* Vol. 9, Sept. 30, 1936, pages 415-419. A review of literature on this subject. The conclusions drawn are, in general, that in order to obtain a satisfactory cementation of steels with normal Cu content, i.e. about 0.3-0.4%, it should be sufficient to avoid the formation of rust on the surface. 5 The effect of hardening by Cu precipitation grows weaker with increasing C content and is hardly appreciable up to 0.9% Cu. Red-brittleness occurs at high temperatures (1100° C. and more) but only with a Cu content higher than 0.5%; below this figure no characteristic heat cracks are observed. The weldability of Cu steel is not seriously affected by Cu up to 0.8%; addition of Cu can even have a favorable action inasmuch as a high mechanical resistance is obtained for low C steels. 16 references. Ha (5)

6

Controlled Gear Manufacture. J. B. NEALEY. *Heat Treating & Forging,* Vol. 22, Aug. 1936, pages 405-406, 410; *Iron Age,* Vol. 138, Dec. 3, 1936, pages 58-60. Describes practice of Fairfield Manufacturing Co., Lafayette, Ind., in heat treating automotive gears, most of which are made from alloy steels. C range must be within 0.15%, and for all carburizing types, grain size is 6-8 on A.S.T.M. chart. All forgings are normalized or annealed, these operations being designed to produce a 175 Br. with minimum reduction of area for maximum machinability. Gears with 7 pearlitic structure were found to have much greater machinability and distort much less than those of the same heat with sorbitic structure. Box-type furnaces are used for carburizing. Tests show that box quenched S. A. E. 4620 drive pinions are supreme in their ability to withstand high skin temperatures without softening. Shank of pinion is softened with a Pb-pot draw at 1100°-1200° F. for 8-10 min. Sometimes shank is Cu plated to prevent carburizing. All ring gears of S. A. E. 2315, 2512, 3115, and some of 4620 are allowed to cool slowly in the pots till cold to minimize 8 distortion. They are reheated to just above upper critical point for core and quenched in oil in a quenching press. Intricate shapes are treated satisfactorily by overcoming section effect. MS + VSP (5)

Surface Hardening of Steel. C. T. EAKIN. *Iron Age,* Vol. 138, July 23, 1936, pages 25-29. Considers carburizing and nitriding, and discusses the nature of carbides and nitrides and processes and equipment by which they are obtained in surface material of 9 steel in most desirable form. Steel used for carburizing is selected from not high enough C or other alloy elements to quench-harden core when part is quenched for hardening the case. Process consists of dissolving the required amount of C in surface of material and quenching to obtain required hardness. Includes table listing steels commonly used for carburizing. Nitriding consists of introducing N into surface of steel by heating the steel to a temperature of 977°-1112° F. in a closed container through which ammonia gas is passed. Lists the steels favored for nitriding. 10 Advantages claimed for nitriding over carburizing are: (a) higher hardness, (b) less distortion, and (c) high corrosion resistance. These claims offset the lower cost/lb., greater availability and better machinability of carburizing steels. VSP (5)

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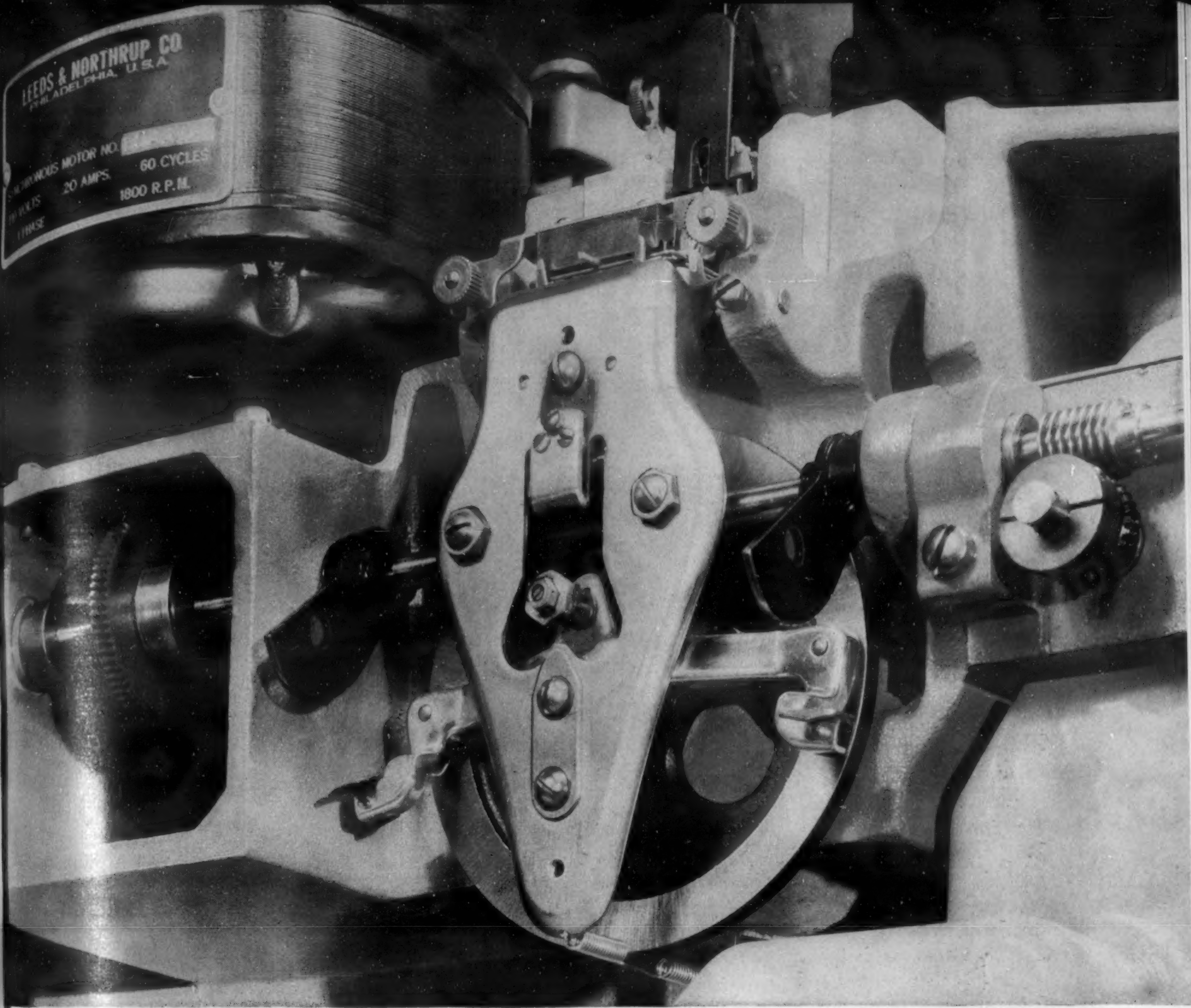

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MEASURING INSTRUMENTS . TELEMETERS . AUTOMATIC CONTROLS . HEAT-TREATING FURNACES

Recent Developments in the Gas Furnace Industry. H. M. HEYN. *Industrial Gas*, Vol. 15, Oct. 1936, pages 14-16. Radiant-tube furnaces and controlled atmospheres are among the principal recent developments for heat treating ferrous and non-ferrous metals. A gas for a neutral atmosphere that can easily be changed according to conditions is obtained by burning 6 parts of air with 1 ft.^{3} of natural gas, the combustion products of which contain 74% N_2, 9.6% H_2, 8.7% CO, 5.8% CO_2, 1.9% CH_4; sp.g. is 0.91. Equipment for generating this gas is described. Gas carburizing and the continuous Eutectol process are discussed. Ha (5)

Atmospheres and Furnaces in the Wire Industry. H. M. HEYN. *Wire & Wire Products*, Vol. 11, Oct. 1936, pages 507-520. Advantages of prepared gas furnace atmospheres in heat treatment of wire, wire manufacturing processes, furnaces used, control methods, are described and micrographs showing the effect of heat treatment on the structure are given. Ha (5)

5a. Annealing

Universal Method for Bright Annealing, Gaseous Cementation and Nitriding. A. V. SMIRNOV & L. V. BELORUCHEV. *Metallurg*, Vol. 11, May 1936, pages 34-47. In Russian. Description of an installation for decomposing NH_3 and its use for producing controlled atmosphere in furnaces. (5a)

Large Normalizing Furnace at the Landis Tool Co. *Heat Treating & Forging*, Vol. 22, Aug. 1936, pages 403-404. Furnace for normalizing green castings is of the car-hearth type, insulated, and cased in steel plate. Heating chamber is 30 ft. long, 6½ ft. wide, and 6 ft. high, and is fired by 12 low-pressure oil-burners. 2-zone automatic temperature control is used. Castings are heated to 1200° F., held at this temperature for 7-8 hrs., and cooled gradually for 24 hrs. MS (5a)

Ford Anneals Steel Strip with Electric Heat. *Electrical World*, Vol. 106, Oct. 24, 1936, pages 60-61, 70. Large installation of electric furnaces for controlled atmosphere annealing of sheet steel is described. Each of 26 bell type furnaces has 3 stands for continuous operation. CBJ (5a)

The Influence of Annealing of Sheet Zinc on Examination by Erichsen Method. A. A. BOTCHVAR & L. I. DMITRIEV. *Izvestia Sektora Fiziko-Khimicheskogo Analiza*, Vol. 9, 1936, pages 147-152. The Erichsen number of Zn decreases with increase of the annealing temperature, but in the interval 150-200° C. it increases slightly. The grain size change with annealing temperature is abnormal at 100-200° C. and 250-300° C. The abnormal change of the grain size is connected with some modification in the recrystallization course. The hexagonal system of Zn is the cause of the abnormality in the change of Erichsen number by annealing. NA (5a)

5b. Hardening, Quenching & Drawing

Notes on Quenching. J. F. RYAN. *Heat Treating & Forging*, Vol. 22, Aug. 1936, pages 389-390, 393. Paper presented before Steel Treatment Society of Australia, Jan. 29, 1936. Outlines advantages and disadvantages of various media for quenching steel, with chief attention to oils, oil circulation and cooling. MS (5b)

Improved Toughness in Quenched Alloy Steel. GEORGE W. AKIMOW. *Metal Progress*, Vol. 30, Nov. 1936, pages 54, 98. 3.0-4.0% Ni steels with 1.0-1.5% Cr and with or without 1% W, a 1.0-1.5% Ni steel with 0.5-1.0% Cr and 0.2-0.3% Mo and a Cr-Si structural steel were studied over the quenching range 1475-1830° F. and the residual austenite was found not to increase with increasing quenching temperature. Increased impact resistance was noted with a low draw. WLC (5b)

Better Rails for the Iron Horse. *Iron Age*, Vol. 138, June 18, 1936, pages 34-39, 88. Gives a résumé of recent advances in the manufacture of rails with special reference to the elimination of transverse fissures, and describes Bethlehem Steel Co.'s rail heat-treating procedure and method of reducing end batter. The treatment is known as the Kenney process, covered by U. S. reissue patent, No. 17,240. VSP (5b)

Quenching of Steels and Metallic Alloys (La trempe des aciers et des alliages metalliques) L. GRENET. *Métaux*, August 1936, pages 156-165. General review of heat treatment of steels. GTM (5b)

Effect of Rate of Drawing through Lead Bath in Patenting on the Tensile Properties of Steel Wire (Einfluss der Durchlaufgeschwindigkeit beim Bleipatentieren auf die Festigkeitseigenschaften von Stahldraht) A. POMP & H. RUPPIK. *Stahl und Eisen,* Vol. 56, Aug. 6, 1936, pages 899-903. A 0.66% C steel was patented at different quench and lead bath temperatures and at different rates of drawing through the lead bath. Better bend and twist tests were obtained after drawing at medium or slow rates through the lead bath. SE (5b)

5c. Aging

On the Phenomenon of Incubation of Alloys. KOTARO HONDA & KANZI TAMARU. *Bulletin Institute of Physical & Chemical Research,* Tokyo, Vol. 15, June 1936, pages 315-319. In Japanese. *Scientific Papers & Abstracts Institute of Physical & Chemical Research,* Tokyo, Vol. 29, June 1936, page 23. In English. The incubation phenomenon of duralumin has been known since the alloy was discovered by Wilm in 1911, but its cause has not yet been satisfactorily understood. The authors investigated the phenomenon in Cu-Be and duralumin by hardness, electrical resistance and density tests. Incubation is explained by the differential effect of hardening caused by the lattice distortion by the dissolved atoms present in the vicinity of grain boundaries and of softening due to their subsequent precipitation. WH (5c)

5d. Malleableizing

Mass Annealing of Malleable Iron. J. B. NEALEY. *Industrial Heating,* Vol. 111, Dec. 1936, pages 827-832. The metallurgy of the malleabilizing process is explained according to research recently finished at the University of Michigan. To shorten the annealing time for the process, it is recommended to raise the Si range of the Fe used from 0.9-1% to 1.5-2.0%, to use controlled atmosphere so that the inert packing material can be eliminated and to adopt higher superheating temperatures in melting the Fe. As an illustration, an Fe made in the electric furnace with a superheating temperature of 3180° F. and containing 1.4%C and 1.7% Si which was completely malleabilized by annealing in a gas atmosphere for 6.5 hrs. without scaling or decarburizing had a tensile strength of 59,700 lbs./in.^{2}, yield point 60,200 lbs./in.^{2}, and elongation 12.5%. Ha (5d)

Malleable Iron with Spheroidized Cementite Structure. S. S. NEKRITI. *Liteinoe Delo,* Vol. 7, No. 7, 1936, pages 43-44. In Russian. Castings are made of iron containing 2.4% C, 0.9% Si, 0.9% Mn. They are heated in 10 hrs. to 940° C., soaked at the temperature for 30 hrs., rapidly cooled to 650° C., soaked at this temperature for 1 hr., heated to 705° C. and kept at 705° C. for 30 hrs., which constitutes the final spheroidizing treatment. Castings are then cooled with the furnace. The properties of the metal so produced are superior to those of the usual black heart malleable. (5d)

5e. Carburizing

Making Molds for Die Castings and Plastics by the Hob Sinking Method. A. C. GRAHAM & JOHN DE CARDY. *Steel,* Vol. 99, Sept. 28, 1936, pages 42-44. Describes methods of producing and heat treating dies. Material used is a slightly alloyed electric-furnace steel, annealed to 100 Br. hardness. After hobbing and fitting of holder plate, die is carburized at 1650° F. for 2 hrs., cooled in air to 600° F., heated to 1450 F., quenched in oil, and drawn at 425° F. for 2 hrs. Rockwell hardness is about C60. Master hobs are made from spheroidized steel. When in final form, hob is carburized at 1750° F., quenched in oil, and drawn at 500° F. for 2-4 hrs. Rockwell hardness is C55-C58 and should not exceed C58. MS (5e)

Carburizing, Single Quench or Double Quench. *Metal Progress,* Vol. 30, Oct. 1936, pages 35-38. Discusses 8 articles dealing with carburizing and subsequent treatment. WLC (5e)

Case Hardening of Steel Parts in Cyanide Mixture. EDMUND R. THEWS & R. W. SNELLING. *Mechanical World & Engineering Record,* Vol. 100, Aug. 21, 1936, pages 167-170. The economic operation of a cyanide hardening plant requires an appreciation of the influence of additions and the changes that take place with time and quantity of work. The authors give conclusions from their own work and enumerate various points of advantage and disadvantage whereby observations from a practical point of view are offered on each. WH (5e)

6. FURNACES, REFRACTORIES AND FUELS

M. H. MAWHINNEY, SECTION EDITOR

Temperature Measurements with a New Color Pyrometer (Temperaturmessungen mit einem neuen Farbpyrometer) G. NAESER. *Giesserei,* Vol. 23, July 17, 1936, pages 363-368. See *Metals & Alloys,* Vol. 7, Aug. 1936, page MA 406R/8. Ha (6)

Durability of Refractories. J. F. HYSLOP. *Iron & Coal Trades Review,* Vol. 133, Aug. 28, 1936, page 332. 4 distinct groups of refractories are distinguished. They are, in the order of increasing basicity (1) acid SiO_2; $3Al_2O_3.2SiO_2$; Al_2O_3; $SiO_2.ZrO_2$; SiC-silica, clay, sillimanite, mullite, corundum, zircon, silicon carbide. (2) spinel—R″O.R″′$_2$O$_3$—magnesia spinel, chrome. (3) Orthosilicate—2R″O.SiO_2—olivine, forsterite. (4) Basic—R″O—magnesite, dolomite. A refractory is, in most cases, a collection of mineral crystals set in a glassy bond, their physical and chemical properties depending on nature and amount of the crystalline and glassy phase. All refractories have, even under well-controlled conditions, definite limitations. Silica is good under load, poor in thermal shock; corundum good under both load and thermal shock; sillimanite also good both under load and thermal shock; chrome poor under load and thermal shock; spinel good under both, magnesite poor under both. Spalling resistance of silica can hardly be improved due to the transformation from cristobalite to tridymite taking place between 200° and 300° C. The effect of atmosphere is discussed. Ha (6)

Improved Recuperator Serves New Slab Heating Furnaces. *Steel,* Vol. 99, Aug. 10, 1936, page 52. At the McDonald plant of Carnegie-Ilinois Steel Corp., there are 3 furnaces of the triple-fired type, 18 ft. wide by 75 ft. Each has rated capacity of 50 gross tons of slabs per hr. charged at atmospheric temperature. Natural-gas of 1050-1100 B.t.u./ft.^{3} is used for fuel. All combustion air is preheated to 650° F. in twin recuperators equipped with Carbofrax tubes containing corebusters. Seals of caulking cement at all joints prevent mixture of air and furnace gases. Maximum fuel consumption so far on any 1 furnace is 85,000 ft.^{3} natural-gas per hr., with draft loss across recuperators 0.5 in. H_2O. MS (6)

Electrically Operated Pulverised Fuel Plant. *Electrical Review,* Vol. 119, Sep. 25, 1936, page 402. Describes system in plant of Messrs. Leys Malleable Castings Co., Ltd., Derby, Eng. Powdered coal used in the melting furnaces and annealing ovens and for auxiliary firing of boilers. MS (6)

A New Rotary Oil Melting Furnace. Its Use in Metallurgy (Un Nouveau Four de Fusion Rotatif, Chauffé au Mazout. Son Emploi en Métallurgie) *La Fonderie Belge,* Vol. 4, Jan. Feb. 1936, pages 379-381. Features of this furnace are very fine division of oil, pre-heated air and ease of control. FR (6)

Pouring Pit Refractories—Their Effect on Alloy Steel Quality from an American Viewpoint. E. E. CALLINAN. *Refractories Journal,* Vol. 12, Sept. 1936, pages 475-479. Reprinted from *Blast Furnace and Steel Plant,* Vol. 24, Aug. 1936, pages 685-688. *Iron & Steel Engineer,* Vol. 13, Aug. 1936, pages 15-18. *Metal Progress,* Vol. 30, Nov. 1936, pages 83-86. Paper read before the Ohio Ceramic Industries Assn., Columbus, May 26, 1936. See *Metals and Alloys,* Vol. 7, Dec. 1936, page MA 584R/8. WLC + PCR (6)

High Frequency Electric Furnace Operated with a Tube Generator (Un four électrique à haute fréquence alimenté par un générateur à lampes) G. HELLER. *Journal du Four Electrique,* Vol. 45, Nov. 1936, pages 312-317. Detailed description of a 50-kg. steel melting furnace used at Philips Works at Eindhoven. Furnace is of conventional design but, instead of a usual transformer, a tube generator is used to supply high frequency current. (6)

An Electric Arc Furnace in Paris (Un four électrique à arc dans Paris) R. SEVIN. *Journal du Four Electrique,* Vol. 45, Nov. 1936, pages 309-311. Mechanical details and operating conditions described. (6)

Gas Burners (Gasbrenner) G. NEUMANN. *Stahl und Eisen,* Vol. 56, Aug. 20, 1936, pages 941-952, a large number of different types of gas burners discussed and illustrated. SE (6)

Proper Baffling Eliminates Smoke. D. S. CLARK. *Power Plant Engineering,* Vol. 40, Nov. 1936, page 623. Method used to adjust baffles in multiple drum bent tube, three pass boiler to eliminate smoke. This was done without sacrifice of power. ECK (6)

Heat of Combustion Calculated from Fuel Analyses. J. R. DARNELL. *Power Plant Engineering,* Oct. 1936, pages 580-581. Method of calculating combustion losses from fuel analysis. Sample calculation made on Illinois coal. ECK (6)

High Frequency Furnace in Steel Plants (Le four à haute fréquence dans l'acierie) D. F. CAMPBELL. *Journal du Four Electrique,* Vol. 45, Oct. 1936, pages 349-353. A sketch of the development of these furnaces in England, from experimental installation to the present 5-ton capacity. See *Metals and Alloys,* Vol. 7, Sept. 1936, page MA 448R/4 (6)

A Horizontal Revolving Kiln. H. J. BUSH. *The Industrial Chemist,* Vol. 12, June 1936, pages 266-269. Details of the construction and operation of an improved rotary kiln suitable for roasting ores. RAW (6)

Developments in Temperature Measurement and Control. A. F. BROWNLEE. *Heat Treating & Forging,* Vol. 22, Sept. 1936, pages 465-466, 468, 469, 478. Describes recent developments in instruments and devices for temperature measurement and control of forging and heat-treating furnaces. MS (6)

British Furnace Builder Cites Trend to Gas Fuel in Heat Treating Plants. P. HOPKINSON. *Steel,* Vol. 99, July 27, 1936, page 35. British automotive plants are turning to gas fuel for heat treating. Furnace temperature and atmosphere control and price reduction in gas are factors. Steel mills are extending their use of gas for forging, luminous flames being found satisfactory. Recent forging furnace has 2 chambers with ports between. Both chambers are loaded, and burners on 1 are lighted, heating charge in this chamber, while combustion products preheat other. After removal of hot charge from first chamber, cold charge is put in, burners are shut off, and burners on second chamber are lighted. Car-bottom furnace is used for double heat treatment of steel castings at 1700 and 950° F. MS (6)

Applications of Fused Silica in Heating Processes. Part II. Gas Burners. BURROWS MOORE. *The Industrial Chemist,* Vol. 12, Oct. 1936, pages 451-453. Details of construction and operation of Vitreosil burners for burning coal gas, hydrogen, chlorine, etc. See *Metals and Alloys.* RAW (6)

Electric Heat-Treating Furnaces in Steel Mills. A. N. OTIS. *Iron Age,* Vol. 138, Sept. 17, 1936, pages 51-55. Deals with the wide diversity of application of electric furnaces in steel industry and describes several types. VSP (6)

Air Paths and Fans in Electrically Heated Convection Furnaces (Luftwege und Lüfter in elektrisch beheizten Umluftöfen) K. MERTENS. *Elektrowärme,* Vol. 6, Oct. 1936, pages 290-292. Constructive details of heat-treating furnaces for temperatures for 200 to 500° C. are described. Ha (6)

Heat Treating and Forging at G-E, Schenectady Works. W. C. KERNAHAN. *Heat Treating & Forging,* Vol. 22, Sept. 1936, pages 454-458. Describes heat-treating equipment in the various buildings at the plant. MS (6)

Electric Arc Furnace Economical for Small Heats. ALBERT E. GREENE. *Electrical World,* Vol. 106, Nov. 7, 1936, pages 44-45, 99. Single-phase electric arc furnace permits economies where frequent pours of ½ or 1 ton of metal are necessary. Flexibility of operation, a superior product and good service to the customer are effected. CBJ (6)

An Advance in Zinc Smelting—The Vertical Retort. E. H. BUNCE. *Engineering & Mining Journal,* Vol. 137, Dec. 1936, pages 599-607. Description of the vertical retort installation at the Palmerton, Pa., plant of te New Jersey Zinc Co. Process outlined and traced in its development. The heat transfer of the charge was found to form it into dense agglomerates such as briquets. The agglomerated charge in a vertical retort showed the following advantages: (1) an agglomerated charge moves through a vertical retort by gravity without mechanical aid, (2) use of an agglomerated charge promotes rapid heat transfer from the hot walls of the retort to the center of the charge by radiation, convection and conduction. (3) the retort gases can be conducted upwards through the retort and thence through the condensation system by introduction of displacement gas at the bottom or by control of the stack draft of the retort. WHB (6)

Interstate Drop Forge Company Installs Forge Furnace Control. W. C. KERNAHAN. *Heat Treating & Forging,* Vol. 22, Aug. 1936, pages 377-380. Describes forging, heat-treating, and miscellaneous equipment in plant at Milwaukee. Gives considerable attention to automatic temperature control of forging furnaces. MS (6)

Snort Boxes. A. T. REARDON. *Heat Treating & Forging,* Vol. 22, July 1936, page 355. From a paper entitled "Steel and Superstition" presented before Steel Treatment Society of Australia. Condemns use of obsolete furnaces and furnace equipment. MS (6)

Important Factors in Open Hearth Control. H. H. GORRIE. *Blast Furnace & Steel Plant,* Vol. 24, Apr. 1936, pages 322-325. Furnace design, anxiliary equipment, choice of fuels, charge constituents, desired composition of finished steel, and human element affect design and adjustment of control. Furnace pressure recording and control equipment permits avoidance of excessive infiltration of unregenerated air, or excessive pressures with corresponding poor flame control and flame impingement against brickwork. Use of fuel-air ratio metering and control equipment results in constant supply of air following each reversal, higher flame temperatures, uniform flame control, less carry-over of solids, and, with forced draft fan, definite firing rate throughout furnace campaign even though checkers become dirty. Furnace must be equipped with forced draft fan to maintain proper fuel-air ratio in conjunction with furnace pressure control. Both must be controlled simultaneously to realize all advantages. Roof temperature control results in more uniform firing and protection against roof destruction. Furnace pressure, fuel-air ratio, and roof temperature control are necessary for successful operation of insulated furnaces. Indication of checker temperatures enables checkers to be kept at even temperature and preheated air or gas temperatures as nearly average as possible. Describes typical layout of fuel-air ratio and furnace-pressure control equipment. MS (6)

Electric Furnace Fans. G. B. LAMB. *Electrical Review,* Vol. 119, Sept. 25, 1936. Deals with use of fans for circulating air in electric furnaces for treating metals at 500° C. and lower. Such furnaces have increased rate of heating and more nearly uniform temperature throughout, and give high outputs comparable with those obtained from oil and salt baths, with advantages of cleanliness, high efficiency, and low operating cost. Several applications described. MS (6)

Luminous Flame Burners Are Used on Hube Mill Furnaces. J. B. NEALEY. *Steel,* Vol. 99, Aug. 17, 1936, pages 40-42. Describes furnaces used in manufacture of seamless tubes in plant of Spang, Chalfant & Co., Inc., Ambridge, Pa. Latest type of luminous flame burner is used. MS (6)

Slab Furnaces at the Ford Plant. J. B. NEALEY. *Blast Furnace & Steel Plant,* Vol. 24, Sept. 1936, pages 783-784. **Zone-Fired Slab Reheating Furnaces Eliminate Excessive Scale Loss.** *Steel,* Vol. 99, Sept. 7, 1936, page 69. Describes 2 furnaces serving new strip mill. Each is 44 ft. 5 in. long and 17 ft. wide and rated at 50 gross tons of cold slabs per hr. Slabs are 12-16 ft. long and 3-4 ft. wide. When steel is charged into furnace at 1200°-1400° F., rating is 60 tons of slabs per hr. Gas consumption on cold slabs is 1,650,000 B.t.u./gross ton and on hot slabs, 1,200,000 B.t.u. Refractory tile recuperator serves 1 furnace, and tubular type, the other. MS (6)

Further Tests of Special Refractory Brick in Electric Furnace Roofs (Weitere Versuche mit feuerfesten Sondersteinen au Elektroofengewölben) H. KRAL. *Stahl und Eisen,* Vol. 56, Sept. 3, 1936, pages 1000-1002. Various substitutes for silica brick such as "magnesidon," "bikorit," "diaxil," "alusil," "chromodur," "magnosil," were tried. None of these was as economical or serviceable for electric furnace roofs as silica brick. SE (6)

Relation between the Pressure Set Up in a Coke Oven Furnace and Its Operation (Zusammenhänge zwischen Treibdruck der Kohle und Ofenbetrieb) B. HOFMEISTER. *Stahl und Eisen,* Vol. 56, July 30, 1936, pages 857-861. It is indicated that many of the difficulties in coke-oven operation are due to the setting up of excessive pressures in the furnace. SE (6)

Adjustable Rod-Temperature Regulator or "Temperature Selector" (Einstellbarer Temperaturregler oder "Temperaturwähler") P. BREITING. *Elektrowärme,* Vol. 6, Oct. 1936, pages 292-294. A thermostat is described which permits adjusting the temperature of water heaters in wide limits so that the current is less frequently broken and closed again as the thermostat can be set to the temperature desired in a certain case or time. Ha (6)

7. JOINING

7a. Soldering & Brazing

C. H. CHATFIELD, SECTION EDITOR

Low Temperature Brazing with Silver Alloys. PHILLIP KRIEGEL. *The Welding Engineer,* Vol. 21, Aug. 1936, pages 32-36. Procedure for brazing with Ag solders is detailed in text and illustrations. Typical joints made by process are shown in photos. WB (7a)

Silver Dipping vs. Soft Soldering. GEORGE A. BANGERT. *Welding Journal N. Y.,* Vol. 15, Oct. 1936, pages 55-56. Discussion of method of joining stranded wires to conductors by means of dipping into pot of Ag-solder maintained at 1600° F. Especially suitable for enameled wire since sanding of wires is not necessary and the high temperature dip burns off the enamel. WB (7a)

7b. Welding & Cutting

E. V. DAVID, SECTION EDITOR

Oxyacetylene Flame-Hardening. F. E. ROGERS. *Industry and Welding,* Vol. 9, Dec. 1936, pages 48-50. Gear teeth, trolley car rails, wobblers, shafts, crankshafts, etc., may be flame hardened if steel is of suitable grade. WB (7b)

Jigs for Oxyacetylene Welding. *Industry and Welding,* Vol. 9, Dec. 1936, pages 15-19 (to be continued). From a bulletin prepared by 1935-36 Oxyacetylene Committee. Thin sheet is more affected by welding heat as regards distortion due to single direction of expansion and contraction. Three methods of controlling warpage and edge movements are: Absorbing heat, equalizing the effects of heat, or restraint during welding. Methods of accomplishing these results are discussed for a variety of jigs, clamps, blocks, separators. WB (7b)

Simple Fixtures Assure Correct Welding. FRED B. JACOBS. *Welding Engineer,* Vol. 21, July 1936, pages 26-28. Simple jigs for simple and complicated welding jobs are discussed as to time saving and improvement in weld quality. Illustration of the jigs are given for a variety of applications. When jigs are used it is possible for welder to do work in downhand position. WB (7b)

High-Speed Motion Pictures of Flash Welding. W. E. CRAWFORD & WALTHER RICHTER. *Welding Journal, N. Y.,* Vol. 15, Oct. 1936, pages 12-13, 20. Motion pictures taken at speed of 750 to 1160 frames/sec. are shown in part. Discussion of the evidence indicates the flash is due to expulsion of material from metal which has previously been melted locally by short circuit current. WB (7b)

"The Invisible Ray" It Welds . . . It Smelts. T. W. LIPPERT. *Iron Age,* Vol. 138, Aug. 20, 1936, pages 26-31. A critical review of Antonio Longoria's high-frequency method of welding thin non-ferrous metals. The process gives good results on thin metals but is not applicable to thick metals. Considers briefly high-frequency process of reduction of ore claimed by a Japanese metallurgist. VSP (7b)

Stack (Flame) Cutting of Railroad Parts. B. F. ORR. *Industry and Welding,* Vol. 9, Dec. 1936, pages 24-28. Permanent templates consisting of 3/8" plywood reenforced with 3/8" x 1½" strips screwed to under side. Jigs are used with stops to allow labor gang to stack plates in position for flame cutting. For ¼" material, sheets are stacked 12 high and clamped by pneumatic device along the line of cut. Greatest economy found in use of top speed of cutting for the material. The flame cut method has advantage over shearing and coping method in that a large saving is effected by re-use of recovered scrap. The recovered scrap is in large enough pieces to be used for other construction. An estimate is made of $200 worth of usable material recovered during a 6-hr. work-shop day. In addition, flame cutting produces identical sections with no burrs or slivers and no tearing occurs in forming operations on the sheet. WB (7b)

Welding Malleable Iron and Cultivator Shovels. V. L. SAGE. *Industry & Welding,* Vol. 8, June 1936, pages 34-35. Brief, practical article on differentiating between cast, malleable Fe and cast steel. Malleable Fe should be bronze welded since cast Fe of steel filler rods would produce cast Fe bond of lower strength than the malleable Fe. See also *Metals & Alloys,* Vol. 7, Feb. 1936, page MA 66R/8. WB (7b)

All-Welded Structural Steel Low-height Flat Car. CHARLES SCHENCK. *Iron Age,* Vol. 138, July 16, 1936, pages 43-45. See *Metals & Alloys,* Vol. 7, Sept. 1936, page MA 449L/9. VSP (7b)

Electric Welding in Cruiser Construction. C. E. SHERWIN. *Welding Journal,* London, Vol. 33, Apr. 1936, pages 109-111, 114; *Engineer,* Vol. 161, May 1, 1936, pages 472-474; *Engineering,* Vol. 142, July 31, 1936, pages 131-134; Aug. 7, 1936, pages 159-160. From a paper read before the Institution of Naval Architects, Apr. 1936. Brief account of the welding methods adopted during the building of a cruiser with a large amount of welded structure. WB + VSP (7b)

The New Low Alloy, High-tensile Steels. A. B. KINZEL. *Industry & Welding,* Vol. 8, May 1936, pages 61-68. See *Metals & Alloys,* Vol. 7, Oct. 1936, page MA 500L/2. WB (7b)

Ignition Velocity and Flame Capacity of Industrial Gases when Burnt with Oxygen (Zündgeschwindigkeit und Flammenleistung technischer Gase bei Verbrennung mit Sauerstoff) H. BRÜCKNER, W. BECHER & E. MANTHEY. *Autogene Metallbearbeitung,* Vol. 29, Sept. 1, 1936, pages 257-259. The importance of the ignition velocity of the gases used for fusion welding is discussed and the velocity when burned with O was determined for H, CO, CH_4, C_2H_2, propane, watergas and city gas. The suitability of a gas for welding is determined in the first place by the heat capacity of the flame which is defined as that heat quantity developed in unit time by a Bunsen flame of given height. C_2H_2 develops about 3 times as much heat as H, and still much more than other gases. Ha (7b)

Glasses Are Important in Welding. E. L. HETTINGER. *Industry & Welding,* Vol. 8, July 1936, pages 25-26. Importance of eye protection from ultra violet and infra red is discussed and excessive glare is shown to decrease operator's welding efficiency. Glass shades should be matched against the arc amperage due to more intense radiation at higher amperage. Arc light reflection and leaks through hoods can also cause disturbance. WB (7b)

Some New Applications of Oxygen and Acetylene Flame (Quelques applications nouvelles de la flamme oxy-acétylénique et de l'oxygène dans l'industrie sidérurgique) ROCHETTE DE LEMPDES. *Revue de Métallurgie,* Vol. 33, Sept. 1936, pages 556-559. A brief description of the methods used in metallurgy of Fe in which oxy-acetylene cutting flame is used. Deseaming, shaping and heat treatment by means of blow torches is mentioned. Replacement of manual chipping with oxygen deseaming is advantageous when large amounts of metal are to be removed. JDG (7b)

Arc Welding of High Carbon and Alloy Steels. T. N. ARMSTRONG. *Transactions American Society for Metals,* Vol. 24, Sept. 1936, pages 567-594. Presents data from which it is concluded that preheating of parts to be welded will not prevent unsatisfactory ductility and shock resistance in locations adjacent to the weld when the materials welded are high C or alloy steels tending to air-harden. 16 references. WLC (7b)

The Welding of Herculoy. EDWARD S. BUNN. *Industry & Welding,* Vol. 8, Apr. 1936, pages 46-55. Complete, practical instructions and discussion with sketches and tables. C- and metal-arc welding, fluxes, flame welding detailed. Physical properties given in tables for various metal thicknesses under various conditions of welding. WB (7b)

Welding of Recent Pullmans of the German State Railways (Schweissen beim Neubau von Personenwagen der Deutschen Reichsbahn) FRIEDRICH BODEN. *Organ für die Fortschritte des Eisenbahnwesens,* Vol. 91, *Fachheft "Das Schweissen im Eisenbahnwagenbau,* June 15, 1936, pages 241-247, discussion, page 248. Paper at the Schweisstechnische Versuchsabteilung Wittenberg 1936, historically reviews the various models of welded German Pullmans and tabulates weight data. The balance of the paper is discussed under the following: practical experience on welded constructions, welding methods, electrodes and structural steels. WH (7b)

Welding Bottom of Gas Holder. D. P. CONNERY. *Welding Journal,* N. Y., Vol. 15, Sept. 1936, page 19. The bottom of a gas holder 220 ft. in diameter weighing 300 tons was made by arc butt-welding steel plates. WB (7b)

Grand Coulee Construction Work Speeded with use of Welding and Cutting. HENRY W. YOUNG. *Welding Engineer,* Vol. 21, June 1936, pages 28-30. Operations consisted of welding mammoth steel cofferdam, erecting various buildings, fabricating equipment and repairs to equipment. 1000 lbs. of welding rod are used per week; 10 tank O_2 manifold serves 40 stations through 1" welded pipe with flame trap at each station. Large acetylene generator serves the 40 stations with smaller auxiliary as emergency standby. WB (7b)

Locomotive Repair and Welding. FRANK A. LONGO. *Industry & Welding,* Vol. 8, Apr. 1936, pages 19-22, 36; July 1936, pages 27-30; Aug. 1936, pages 35-38. See "Maintenance Welding in Railroad Works," *Metals & Alloys,* Vol. 7, June 1936, page MA 298R/3. WB (7b)

Elements of Hard-Facing Rod Application. CHESTER MOTT. *Industry & Welding,* Vol. 8, Apr. 1936, pages 26-29. See "Self-sharpening and Other Effects on Wear Resisting Metals," *Metals & Alloys,* Vol. 7, Apr. 1936, page MA 190R/4. WB (7b)

Low Alloy Steels and Their Applications. H. M. PRIEST. *Welding Journal,* N. Y., Vol. 15, May 1936, pages 2-12; *Industry & Welding,* Vol. 8, June 1936, pages 54-57; July 1936, pages 57-59; Aug. 1936, pages 60-62, 64. Yield points for the low alloy steels occur at a higher unit stress than for the C steels. Since the ductility is satisfactory a higher designing unit stress is justified when proportioning the members made of these low alloy steels. A saving of 40% in area of a steel tension member is possible but corresponding economy is not always possible for compression members. Hot pressing and other forming operations on low alloy, high tensile steels are discussed at length with diagrams illustrating the practice. Welding as applied to light weight railway cars, etc., is discussed. WB (7b)

Application of Welding to Small Members. *Industry & Welding,* Vol. 8, Sept. 1936, pages 44-49. The use of small sections welded together is shown to produce parts serving same use as heavier castings and taking up less space. Bending of certain parts to shape desired for welding into assembly produces simple structure with minimum of welding. WB (7b)

Braze Welding Carboloy Inserts. *Industry & Welding,* Vol. 8, Aug. 1936, pages 46-47. Details discussed and illustrated. Thorough cleaning of bit and recess by grinding and degreasing with CCl_4 is essential part of procedure. Preheating also necessary to prevent cracking or flaking of Carboloy. WB (7b)

Welded Beam for 2000 Ton Press. *Mechanical World & Engineering Record,* Vol. 100, July 3, 1936, pages 7-8. To avoid the possibilities of flaws it was decided to build the exceptionally large machine part by welding. The method adopted for securing "over-pressure" in the tie-bolts is also described. WH (7b)

Welding and Cutting of Metals. *Metal Progress,* Vol. 30, Oct. 1936, pages 215-221, 226. Reviews work on use of torches for fusion welding, stress relieving, brazing and hard-facing. Inspection of welds and various codes are discussed. The cutting, almost a machining operation, on steel by means of gas torches is discussed. WLC (7b)

"The Proof of the Pudding." *Oxy-Acetylene Tips,* Vol. 15, Oct. 1936, pages 221-226. Case histories of damaged machinery repaired by bronze welding prove the permanence of the method. CBJ (7b)

An All-Welded Factory Building. *Welder,* Vol. 8, July 1936, pages 1003-1007. Reprinted from The Commonwealth Engineer, Australia. Details are given of construction and structure as welding progressed. WB (7b)

Welding and Cutting Play Important Roles in Straightening of Tilted Bridge Pier. *Welding Engineer,* Vol. 21, June 1936. Description of emergency construction by welding, of rings outside of pier to straighten and strengthen against recurrence of tilt. WB (7b)

The Contractors Complete Repair Shop. A. F. DAVIS. *Industry & Welding,* Vol. 8, Apr. 1936, pages 38-40. Photographs and discussion of various successful repairs on large structures for severe service. WB (7b)

Do You Want to Build a Swimming Pool? A. F. DAVIS. *Industry & Welding,* Vol. 8, Sept. 1936, pages 27-29. Details of construction and joining of plates. WB (7b)

Some Diversified Recent Welding Applications. A. F. DAVIS. *Welding Journal,* N. Y., Vol. 15, Sept. 1936, pages 13-16. Review with photographs. WB (7b)

Circuit Characteristics and Arc Stability. S. C. OSBORNE. *Welding Journal N. Y.,* Vol. 15, Oct. 1936, pages 49-35. Methods of testing welding generator for arc stability and welding performance are discussed and described. The present most prevalent method of oscillograph test is concluded to be of little value to determine arc performance and stability, and time of recovery measured by this test means nothing. Another type of test is described and recommended as being more indicative of performance of machine with respect to voltage response and current surge after short circuit in actual welding since the short circuits are of such short duration that voltage and current never reach static values. Other desirable performance characteristics in addition to arc stability are enumerated and discussed in detail with respect to striking the arc, breaking the arc, penetration, sticking of the rod, control of heat, direction of arc, and splatter. WB (7b)

The Control of Expansion and Contraction by Local Heating in Cast Iron Parts. ROY PETERSON. *The Welding Engineer,* Vol. 21, Oct. 1936, pages 36-37. Abstract of paper by author at Midwest Welding Conference, Chicago, June 4-6. WB (7b)

Preparation of Welding Work in Repairing and Small Shop Work (Vorbereitung von Schweissarbeiten im Reparatur- und Handwerksbetrieb) H. H. GRIX. *Autogene Metallbearbeitung,* Vol. 29, Sept. 1, 1936, pages 262-263. Examples illustrate best procedure. Ha (7b)

A Rubber Heel Press Repaired. J. W. GILLESPIE. *Industry & Welding,* Vol. 8, July 1936, page 31. Press casting was manganese-bronze welded at a cost of $150 as against $450 for new casting. WB (7b)

Bronze Welding Buoys. OWEN C. JONES. *Industry & Welding,* Vol. 8, June 1936, pages 43-44. Gives details. Body of buoy made of steel and it is reported no electrolytic corrosion between bronze and steel takes place. WB (7b)

Economical Fabrication. O. C. JONES. *Welding Journal,* N. Y., Vol. 15, Sept. 1936, pages 11-12. Some typical flame cut sections and structures fabricated from castings and flame cut parts are illustrated and briefly described in text. WB (7b)

Welding of Aircraft Structures. J. B. JOHNSON. *Welding Journal,* N. Y., Vol. 15, Sept. 1936, pages 2-11. Discussion of welding methods and processes used in aircraft field, chemical contents and physical properties of ferrous and non-ferrous aircraft materials for welding. Fatigue properties of welded steel tubes are tabulated for various methods of welding and varied base metal and rod. Cold rolled 18-8 is difficult to fusion weld due to warping, but is easily fabricated by spot welding. 99% Al or Mn-Al alloy are fusion welded, being non-heat-treatable, but Al-Cu-Mg alloys require spot welding. Design of tube welds, methods of fabrication, testing procedures detailed. Magnaflux inspection test considered most practical for aircraft tube welds. WB (7b)

The Welding of Beryllium Copper. I. T. HOOK. *Industry & Welding,* Vol. 8, Aug. 1936, pages 55-59; Sept. 1936, pages 61-64. Be-Cu may be soft soldered, hard soldered, C-arc welded. Brazing, oxy-acetylene welding and metal arc welding are unsuccessful because of formation of a tough refractory BeO film on molten metals which prevents joining of liquid metal. Procedures for joining Be-Cu are given. Test data are reported for C arc welds on Be-Cu giving tensile strength of weld and elongation obtained. Heat treatment of brazed or welded Be-Cu is possible. Be-Cu coatings may be cast on steel or copper by the C arc. WB (7b)

Electric Spotwelding Apparatus (Elektrische Punktschweisszeuge) F. HOCH. *Zeitschrift Verein deutscher Ingenieure,* Vol 80, July 25, 1936, pages 911-913. Portable welding apparatus, particularly for use with heavy, unwieldy pieces are described. Ha (7b)

Welding in Strip Mill Practice. J. SELWYN CASWELL. *Welding Journal,* London, Vol. 33, Apr. 1936, pages 106-108. See *Metals & Alloys,* Vol. 7, Oct. 1936, page MA 498R/9. WB (7b)

The Metallurgy of "Pure" Iron Welds. GILBERT E. DOAN & WILLIAM C. SCHULTE. *Transactions American Institute Mining & Metallurgical Engineers,* Vol. 120, *Iron & Steel Division,* 1936, pages 346-362; *Welding Journal,* N. Y., Vol. 15, Sept. 1936, Supplement pages 5-11. See *Metals & Alloys,* Vol. 7, June 1936, page MA 301R/6. WB (7b)

Bridge Welding—A Review of the Literature. III, IV. F. H. FRANKLAND. *Welder,* Vol. 8, July 1936, pages 1020-1021; Aug. 1936, pages 1051-1053. See *Metals & Alloys,* Vol. 7, May 1936, page M9 241L/10. WB (7b)

New Method for Welding Together Ferrous Metals by Application of Heat and Pressure. LEONARD C. GRIMSHAW. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 120, *Iron & Steel Division,* 1936, pages 363-386. Includes discussion. See *Metals & Alloys,* Vol. 7, May 1936, page MA 238R/9. (7b)

Mile-Long Rails Installed in GEO Test Track. *Railway Engineering & Maintenance,* Vol. 2, June 1936, pages 352-356. In an experimental track installed near River Valley, Pa., the Bessemer and Lake Erie R. R. has butt-welded both rails by the thermit process and by means of permanent monuments and strain gage readings, it is planned to observe longitudinal and lateral movements of the rail, and the magnitude of stresses set up by temperature changes. The provisions for the test, the installation of new track and the welding procedure are described and illustrated. Analyses of weld metal and rail metal show (1) for the weld .407 C, .74 Mn, .036 P, .058 S, .44 Si; and (2) for the rail .73 C, .75 Mn, .027 P, .034 S, .15 Si. FPP (7b)

Some Considerations on the Spot Welding Applied to Light Alloys (Quelques considérations sur la soudure par points appliquée aux alliages légers) G. MANDRAN. *Métaux,* Vol. 11, Sept. 1936, pages 174-185. The form of the spot weld and its influence on the grain size of the welded metal discussed. GTM (7b)

Welded Rolled Steel in Machine Construction. H. G. MARSH. *Welding Journal N. Y.,* Vol. 15, Oct. 1936, pages 70-71. *Industry and Welding,* Vol. 9, Oct. 1936, pages 40-43. In 1935 80 million lbs. of electric welding rods were used which is assumed to have joined 2-3 million tons of steel on the basis of 25-40 lbs. of rod per ton of steel. Machinery construction in general has been less progressive than other industries in eliminating much use of castings in favor of welded rolled steel. Advance in this field appears to be a matter of overcoming sales resistance due to consumers' doubts as to weld reliability. Author believes supply of reliable, workable weld data to machine designer would increase use of welding in this field. See *Metals and Alloys,* Vol. 6, Feb. 1935, page MA 60L/8. WB (7b)

Comparative Economies of Metal Electrodes. KARL MELLER. *Welding Engineer,* Vol. 21, July 1936, pages 34-35; Aug. 1936, pages 38-43; Sept. 1936, pages 56-60. Welding electrodes are judged on basis of condition of the rod, welding qualities, qualities of the joint and costs of the joint. Influence of various factors on welding costs are analyzed. Test conditions for obtaining quantitative data on welding rods are reviewed as (1) weight of rod melted, (2) deposit weight, (3) current, (4) voltage, (5) power consumption, (6) welding time. Tests made mostly with 4 mm. diameter rods. 3 and 5 mm. bore rods and 6 and 8 mm. covered rods were tested to determine effect of diameter. Second article deals with bare electrodes and data are reviewed for melting rate (kg. deposit/hr.) versus current, length of rod, diameter, polarity, composition, arc length. Comparisons are made between different rods for weight of rod melted, deposited and evaporated. Melting rate is fairly constant for all diameters, polarity has pronounced effect on melting rate increasing 100% or more for positive over negative polarity. Author considers too much attention is paid to arc voltage and not enough to reducing voltage losses in cable, contacts and wire. Increase in voltage has a slight effect on weight melted and decreases to greater extent the weight deposited due to increase in the evaporation losses. At higher voltages the short circuit frequency is decreased giving a steadier arc. Greatest effect of arc voltage is in appearance of weld bead and penetration into base metal; increasing voltage increases penetration, but medium voltage gives optimum appearance. At 22 volts, 170 amps., 125 mm./min. with 4 mm. base rods, the deposit has same appearance as coated rod weld and, author suggests, results with coated rod are attributable to higher voltage used rather than the coating. Third article deals with covered electrodes and indicates these have higher melting and deposit rates than bare rods. Polarity affects these rates and losses are greater at higher arc voltages. Oscillograms show arc stability of much higher order than for bare rods. Optimum appearance of weld obtained at medium current value and increase in current tends to flatten out the bead considerably together with poorer weld quality. Power consumption in the arc is practically constant for any current. Comparison of coated electrodes shown to be possible on basis of deposit coefficient but total economy must take into account labor and electrode costs, the first depending upon speed of welding and other factors. WB (7b)

Welding Properties of Corrosion-Resisting Alloy Steels Improved with Columbium. W. J. PRIESTLEY. *National Petroleum News,* Vol. 28, Jan. 29, 1936, pages 29-30, 72. Paper presented before International Acetylene Association, Nov. 1935. Data are given on the effect of Ti and Cb and the physical properties of various Cr steels particularly their welding ability. VVK (7b)

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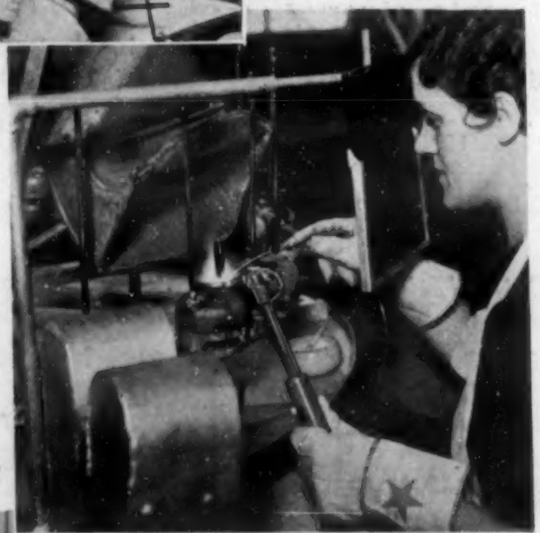

Above: Copper tube being brazed with EASY-FLO to float-valve sheet.

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Right: "Everdur" tube being brazed with EASY-FLO to float-valve base.

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Below: Copper tube and steel valve body being brazed with EASY-FLO to "Ever-valve sheets.

HANDY AND HARMAN 82 Fulton St., New York

Welding Goes to College. R. E. ROBSON. *Industry and Welding,* Vol. 9, Dec. 1936, pages 29-34. Discussion of buildings and grounds maintenance and new installation problems. New return pipe line installed by welding sections in manhole and pulling through ducts, thus eliminating extensive excavation costs. A general survey is made of applications of welding. For pipe welding 3½ times the nominal diam. gives approximate welding time in min. and multiplied by ½ gives approximate time of flame cutting, 1 lb. of rod required for 15-20 linear inches of weld. A new installation is 10% cheaper when welded than when screwed and flanged joints are used. WB (7b)

Welded Structural Designing. H. M. PUDDY. *The Welder,* Vol. 8, Sept. 1936, pages 1059-1061; Oct. 1936, pages 1091-1092, 1097. Continuation of civil engineering phase of weld-design in which it is shown that new design by welding reduces weight of beams without impairing strength and that welds, unlike rivets or bolts, are as strong and safe in tension as in shear or compression. Stress put on fact that riveted job cannot be "converted" into welded job but must be weld-designed to give weld economy and rigidity. Leg length of weld is insufficient specification on drawing and throat thickness is required to define strength. Designer should try to choose weld size so operator can lay down welds at same speed and over the same length thus obtaining benefit of skill developed by experience of welder. Detailing is discussed for various secondary, beam and stanchion connections. Examples of unorthodox, but safe connections are illustrated. See *Metals and Alloys,* Vol. 7, Dec. 1936. WB (7b)

Welded Beam-Column Connections. INGE LYSE & G. J. GIBSON. *Welding Journal N. Y.,* Vol. 15, Oct. 1936, pages 34-40. Tests on various side, butt and fillet welded plates making up the beam-column connections are reported and data given in tables and curves. WB (7b)

Hints on Maintenance of Resistance Welding Machines. A. M. MACFARLAND. *The Welding Engineer,* Vol. 21, Aug. 1936, pages 19-20. Maintenance problems discussed for electrodes, switch contacts, condition of work to be welded. WB (7b)

Characteristic Properties of Copper and Their Influence on the Welding Process. E. C. ROLLASON. *The Welder,* Vol. 8, Oct. 1936, pages 1109-1112. Review of refining practice in production of Cu and amount of O_2 as affecting soundness of cast Cu. The lower the O_2 is brought by poling, the higher the H_2 goes and with it porosity unless porosity is due to SO_2 content. The interrelation of H_2 and O_2 in Cu, is discussed in detail as cause of blowhole formation in welding, due to steam generated in metal interior. Deoxidized Cu is suitable for welding but is harder to work, and the absence of O_2 intensifies effect of other impurities such that, to prevent red-shortness in deoxidized Cu, no more than 0.01% Bi, 0.05% Pb, 0.05% Sb should be present. Figures are given of ultimate strength, elongation and reduction of area for tough pitch Cu before and after annealing and deoxidized Cu before and after. Because of the tendency of molten Cu to absorb H_2 and SO_2 and its ready oxidation, the welding rod requires slightly lower m. p. than Cu, deoxidizers, good mechanical and chemical properties and fluidity. Ag, 0.01%, is added to rod for welding fire boxes and condenser tube bottoms giving hardness with high conductivity at elevated temperatures. Borax, powdered glass, sand, Al phosphate are common constituents of welding flux which must have good filming, stability and deoxidizing properties. WB (7b)

Hard-Facing Uses Extended. R. K. KENNEDY. *Mining Congress Journal,* Vol. 22, Nov., 1936, pages 45-47. Deals with hard-facing of mining machinery and equipment. Discusses applications for ferroalloys, non-ferrous alloys, and diamond substitutes, with typical examples of applications of the three methods in connection with crushers, rolls, scrapers, cable plates, bucket dippers and teeth, cutter bits, shovel parts, skip guides, sintering fans, and other equipment subject to extreme wear and abrasion. Description of the actual procedure used in hard-facing the larger parts is given in many cases. BHS (7b)

Hard-Facing Mining Machine Bits. JOHN PARKER. *Mining Congress Journal,* Vol. 22, Nov. 1936, pages 48-49. Discusses the procedure of hard-facing mining machine bits at the Wheelwright Mining Co., using Borod as hard-facing material. An increase in over 100% in the output of coal mined per bit is reported for first year of operation, and this figure is expected to be appreciably increased as methods are improved. BHS (7b)

Welding in the Coal Industry. *Canadian Mining Journal,* Vol. 57, Nov. 1936, pages 592-597. Applications of oxy-acetylene welding blow pipe as a tool for maintenance, fabrication, alteration or emergency operations are noted. WHB (7b)

8. FINISHING

H. S. RAWDON, SECTION EDITOR

8c. Polishing & Grinding

Control of Abrasive Dust. II, III. FRED B. JACOBS. *Mill & Factory,* Vol. 19, Aug. 1936, pages 50-52, 120; Sept. 1936, pages 56-59, 160. The dust hazard attendant on polishing operations is discussed. In dry polishing operations, such as roughing and dry finishing, the dust consists of metal particles; in oil finishing, because of the application of grease or emery cake, dust particles are not so numerous. The dust from buffing operations is almost entirely lint from the wheel, and is less with motor driven polishing and buffing lathes than with belt-driven. Hood and blower installations for several types of polishing and buffing lathes are described and illustrated. Part III. An adequate system for the collection and disposal of abrasive dust is composed of 4 major components: the hoods over the grinding, polishing or buffing wheels; the system of main and branch pipes; the fan for creating the air pressure in the system and the collector that separates the dust from the air and deposits it in a bin for the purpose. Hoods of various designs are described and illustrated and the method of determining the required fan capacity is outlined. The legal aspect of dust-removal, with especial reference to variations among state laws or regulations, is discussed. FPP (8c)

8d. Electroplating

Fast Finishing. H. L. FARBER. *American Machinist,* Vol. 80, Sept. 23, 1936, pages 796-798. A high-speed finishing process for parts to be Ni plated is described. The Ni deposit is 0.0001" thick and made with a current density of about 12 amps/ft.² at 3½ v. in a solution of 10 oz. Ni ammonium sulphate 10 oz. $NiSO_4$, 4 oz. NaCl, 4 oz. boric acid, 4 oz. $MgSO_4$ in 1 gal. H_2O. Ha (8d)

8e. Metallic Coatings other than Electroplating

How to Tin Gray Iron Castings. J. R. SWANTON. *Foundry,* Vol. 64, June 1936, pages 26-27, 87. Gives detailed information on equipment, materials and operation. VSP (8e)

Methods of Detinning Tinplate for Examination of the Thickness and Continuity of the Alloy Layer. A. W. HOTHERSALL & W. N. BRADSHAW. *Iron & Coal Trades Review,* Vol. 132, May 8, 1936, pages 844-846; *Sheet Metal Industries,* Vol. 10, June 1936, pages 449-450, 456, 476. See *Metals & Alloys,* Vol. 7, Sept. 1936, page MA 455L/4. Ha + AWM (8e)

8f. Non-Metallic Coatings

Copperheads or Iron Oxide Defects in Porcelain Enamel. J. J. CANFIELD. *Better Enameling,* Vol. 6, June 1935, pages 19-20, 25. See *Metals & Alloys,* Vol. 7, Mar. 1936, page MA 137R/5. CBJ (8f)

An Anodic Treatment for the Production of Aluminium Reflectors. N. D. PULLEN. *Journal Institute of Metals,* Vol. 59, Aug. 1936, pages 393-400 (Advance Copy No. 744). Describes a dual anodic process designed for treatment of Al surfaces in order to produce a high degree of reflectivity. The first bath in which electrolytic brightening is produced is a mixture of Na_2CO_3 and Na_3PO_4 in the approximate ratio of 3:1 having a strong alkaline reaction. The second bath, in which the reinforcing film is produced, consists of a strong solution of $NaHSO_4$. Data are given showing the reflectivity of Al surfaces treated by this method compared with a standard Ag mirror and other surfaces such as Cr and Ni plate. JLG (8f)

Hairlining of Vitreous Enamels. J. E. ROSENBERG. *Metal Industry,* New York, Vol. 34, Oct. 1936, pages 391-392. Primary cause of hairlining is cracking in the bisque caused by warping in handling or firing. The thickness of coating of the enamel and enamel characteristics are also factors. CBJ (8f)

9. TESTING

Standardization of Analysis for Total Carbon Content of Cast Iron (Contribution a la Standardisation des Méthodes de Dosage du Carbone Total des Fontes) GEVERS. *Bulletin de l'Association Technique de Fonderie,* Vol. 10, June 1936, pages 208-213. Belgian exchange paper presented at the 15th A. T. F. Congress. Progress report in a search for a standard method for total C determination. WHS (9)

9a. Inspection & Defects, including X-Ray Inspection

C. S. BARRETT, SECTION EDITOR

X-Ray Inspection of Boilers (Röntgenprüfung im Dienste der Technik, insbesondere im Kesselbau) OTTO NIEZOLDI. *Die Wärme,* Vol. 59, Apr. 25, 1936, pages 298-300. Aim of X-raying pressure vessels, X-ray testing apparatus including auxiliary equipment, X-ray picture of faulty welds, and further possibilities of utilization are discussed. WH (9a)

X-Rays among the Metals. ANCEL ST. JOHN. *Metal Progress,* Vol. 30, Oct. 1936, pages 162-166. Discusses the use of X-rays for examination of castings and welds. Reproduces exposure charts and explains their use. Discusses diffraction analysis and problems recently investigated by this method. Attempts to predict fatigue failure by X-ray diffraction methods have not resulted in an accelerated test. WLC (9a)

Radiography of Metal in Principle and Practice. KENT R. VAN HORN. *Metal Progress,* Vol. 30, Aug. 1936, pages 45-51. Discusses generation and detection of X-rays and the interpretation of radiographs. Evidences of various types of defects as they appear on the film are described. Applications and installations of X-ray equipment for radiography are described. WLC (9a)

X-ray Examination of Aluminum Wire-bars. M. S. BELETZKII. *Legkie Metallui,* Vol. 5, Apr. 1936, pages 40-42. In Russian. An examination of 2000 Al wire bars revealed cavities 2.5-20 mm. wide and up to 350 mm. long. HWR (9a)

X-ray Inspection of Aircraft. HERBERT R. ISENBURGER. *Aero Digest,* Vol. 29, Aug. 1936, pages 26-27. Brief review. WB (9a)

Progress in X-ray Diffraction Research and Its Value for Material Testing in the Automobile Industry (Fortschritte in der Feinstrukturuntersuchung und ihr Wert für die Werkstoffprüfung in der Kraftfahrzeugindustrie) A. KARSTEN. *Automobiltechnische Zeitschrift,* Vol. 39, Aug. 10, 1936, pages 393-394. Present means and methods for the examination by X-rays of the structure of materials, especially light metals used in the automobile industry, are reviewed. Ha (9a)

9b. Physical & Mechanical Testing

W. A. TUCKER, SECTION EDITOR

The Microcharacter as a Research Tool. W. J. CONLEY, W. E. CONLEY, H. J. KING & L. E. UNGER. *Transactions American Society for Metals,* Vol. 24, Sept. 1936, pages 721-734. The "microcharacter," a hardness testing instrument, is described. Data are given covering typical hardness determinations on metals and their microconstituents. The possibility of its use for recognition of structures and study of machinability of steels and for study of case hardening are discussed. WLC (9b)

The Energy Method for Determining Relative Sliding Wear Resistance. DONALD S. CLARK & R. B. FREEMAN. *Metal Progress,* Vol. 30, Sept. 1936, pages 73-74. Methods described involve the measurement of the energy required to remove metal by sliding a diamond cube of known size over the surface of the specimen. The force is measured by means of a deflection beam on the specimen carrier acting as an armature of a magnetic circuit. This investigation attempts to correlate wear not with the width of a scratch (hardness) but with a combination of scratch width and force necessary to produce the scratch. WLC (9b)

Drawability of Sheet Steel. H. J. Gough. *Metal Progress*, Vol. 30, Sept. 1936, page 49. Describes apparatus for cupping sheet metal by fluid pressure and recording height of spherical dome formed against fluid pressure. The results do not always discriminate between satisfactory and unsatisfactory material but it is believed valuable data can be obtained from the stress-strain curves from the records of this apparatus. WLC (9b)

Hardness Tests. Equipment and Operation. Joseph G. Gagnon. *Metal Progress*, Vol. 30, Oct. 1936, pages 157-161. Discussion of the file, scleroscope, Brinell and Rockwell tests. Conversion tables should not be used to compare value of two or more instruments. WLC (9b)

Influence of Experimental Conditions upon Shrinkage (Einfluss der Versuchsbedingungen auf das Schwindmass) O. Bauer & H. Sieglerschmidt. *Metallwirtschaft*, Vol. 15, June 12, 1936, pages 535-540. Measurements are made on hard Pb containing 16% Sb, 0.21% C and an Al with 0.17% Si, 0.45% Fe, 0.18% Ti. It is found that shrinkage values are independent of the length of the mold. Shrinkage decreases as the maximum temperature of the mold increases. There seems to be no correlation between the thermal expansion of the metal and shrinkage. A standardization of shrinkage experiments is suggested. See also *Metals & Alloys*, Vol. 7, May 1936, page MA 250R/6. GD (9b)

A Deep-drawing test for Aluminium. A. G. C. Gwyer & P. C. Varley. *Journal Institute of Metals*, Vol. 58, 1936, pages 83-96. Includes discussion. See *Metals & Alloys*, Vol. 7, June 1936, page MA 308L/7. (9b)

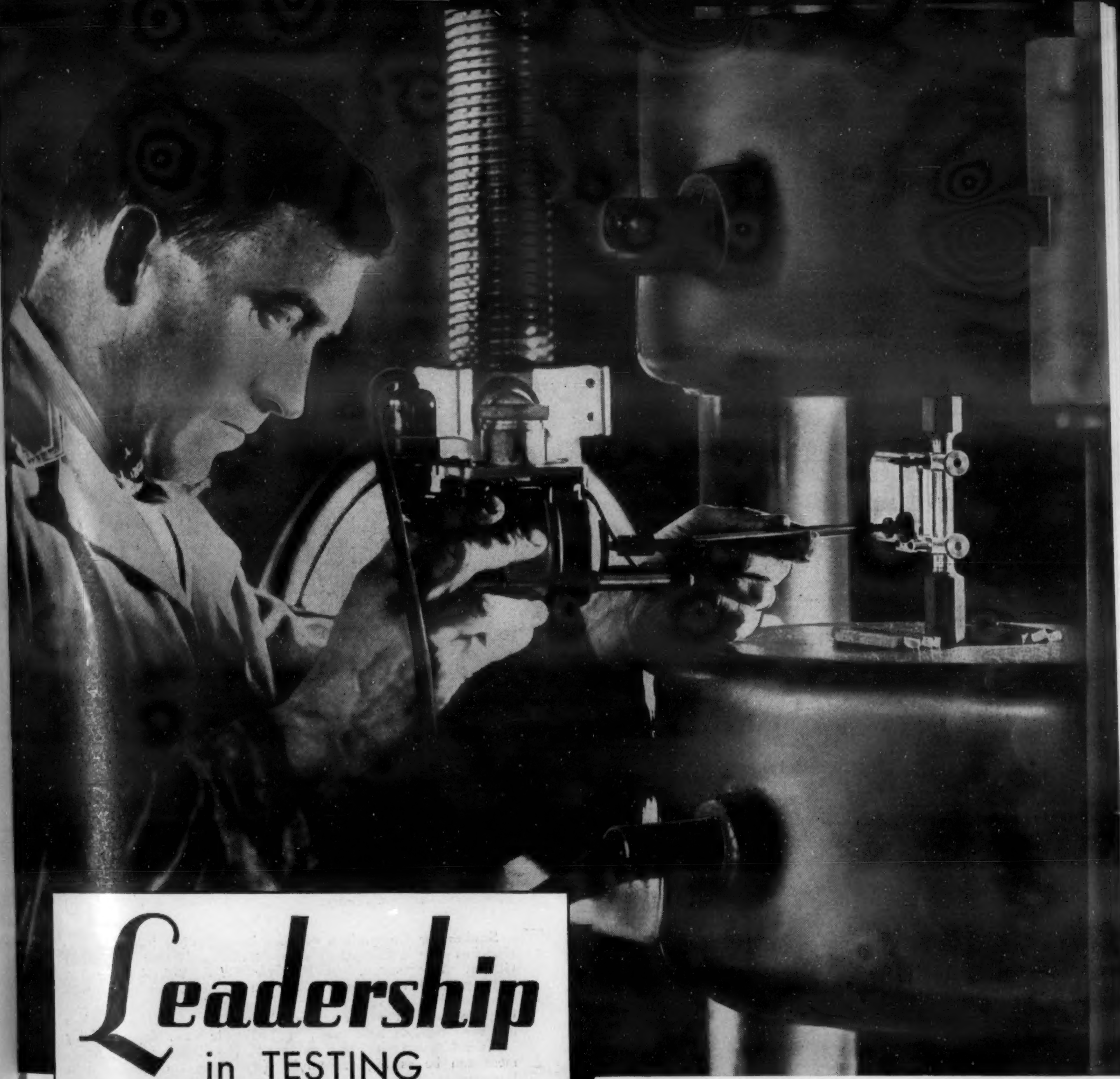
The Institute for Testing Materials of the DVL (Das Institut für Werkstoffborschung der DVL) P. Brenner. *Metallwirtschaft*, Vol. 15, Aug. 7, 1936, pages 745-750; Aug. 14, 1936, pages 770-772. The description of the new laboratory of the Deutschen Versuchsanstalt für Luftfahrt (DVL) at Berlin-Adlershof includes three floor plans and photographs of the special testing equipment. GD (9b)

Strength of Metals in the Light of Modern Physics. H. J. Gough & W. A. Wood. *Journal Royal Aeronautical Society*, Vol. 40, Aug. 1936, pages 586-616; discussion, pages 616-621. The authors present an account of their recent work on the deformation and fracture of metals, in which precise methods of X-ray diffraction have been employed to study systematically the changes produced in the crystalline structure of metals subjected to static tensile and static torsional stressing, and to 3 types of cyclic stressing or fatigue. For the first time it is shown that failures under static and under fatigue stressing are associated with changes in the crystalline structure that are identical for either case. These changes are (1) dislocation of initially perfect grains into large components, of slightly different orientation from the original, (2) formation of "crystallites" that vary widely in orientation from the originals, and (3) the presence of severe internal stresses in the crystallites. Whatever the type of applied stress, at fracture the entire specimen behaves under the X-ray beam as a medium of crystallites showing marked lattice distortion and random orientation. X-ray diffraction methods are claimed to be the first that have distinguished clearly between the effects of applying "safe" and "unsafe" stresses. The present investigation is correlated with previous deformation studies using X-rays, in a preliminary section on cold-rolling and drawing, and a survey is presented of the present position of theories concerning strength and atomic structure, and imperfections in metals. [Barret, *Metals and Alloys*, Vol. 8, Jan. 1937, pages 13-21, presents data on X-ray examination of specimens subjected to fatigue tests that bring him to somewhat different conclusions from those of Gough and Wood. H.W.G.] FPP (9b)

Blast Furnace Measuring Installation of the "Georgs-Marien-Hütte" (Die Hochofen-Messeinrichtung auf der Georgs-Marien-Hütte) S. Hinrichs. *Archiv für technisches Messen*, Vol. 5, June 1936, pages T78-T80. Supervision and measuring instrument installations for charges, water, gas, hot blast, waste gases of blast furnace, coke oven, cement, open-hearth and rolling mill plant are described in detail. Ha (9b)

Potentiometric Analysis in the Steel Works Laboratory (Beitrag zur potentiometrischen Analyse im Hüttenlaboratorium) E. Feil. *Angewandte Chemie*, Vol. 49, Aug. 8, 1936, pages 606-611. Some recently tried out simplified methods to determine the Fe content in ores and slags by Sn chloride and the potentiometric determination of S in ores, pig and cast Fe and steel are described in detail. Ha (9b)

Electromagnetic Testing of Steel Ropes (Elektromagnetische Prüfung von Stahl-Drahtseilen) H. Mackh. *Archiv für technisches Messen*, Vol. 5, June 1936, pages T81-T82. The various methods to detect flaws and defects in ropes, new and in operation, by means of d.c. magnetic apparatus are described, including experiments and results. See *Metals and Alloys*, Vol. 7, Nov. 1936, page MA 541L/6. Ha (9b)



Development of Testing Methods for Iron Castings Used in Agricultural Machinery on the Basis of Classification of Castings. A. E. Omelianov. *Liteinoe Delo,* Vol. 7, No. 7, 1936, pages 21-27. In Russian. Properties of specimens of different size and shape were compared. The use of different specimens in order to determine the properties of castings having varying dimensions seems to be necessary. (9b)

Studies for Comparison of Cast Iron Testing Methods (Recherches pour la Comparaison des Méthodes d'Essais des Fontes) Gustav Meyersberg. *La Fonderie Belge,* Vol. 4, Mar.-Apr. 1936, pages 384-401. (1) Transverse tests: Belgian results with small test bars are very similar to those obtained in Germany with large test bars. Disagreement would be even less if large test bars had been used in both cases. (2) Tensile tests: Reproducibility depends largely on testing conditions. (3) hardness tests: Agreement can be as high as 98%. (4) Shear and torsion tests: Divergences were: 2.7% for Sipp-Rudeloff test, 3.3% for Thyssen-Bourdouxhe and Deleuse tests, 7.3% for the Fremont test. FR (9b)

Viscosity Measurement. Rotation Viscosimeter (Viskositäts-Messung. Rotations-Viskosimeter) W. Philippoff. *Archiv für Technisches Messen,* Vol. 5, June 1936, page T83. The principle of the rotation viscosimeter, whereby the torque on a rotating body is measured which tries to take the liquid along by friction, and several instruments are described. The measurement by this principle is independent of the density of the liquid so that the true dynamic viscosity is determined. Ha (9b)

The Use of Thermoelements (L'Emploi des Couples Thermo-Electriques) L. Scheepers. *Revue Universelle des Mines,* Vol. 12, Sept. 1936, pages 369-375. Principles of thermoelectricity and its applications to practical measurements explained, the composition of thermocouples and their protective tubes described, and electrical resistance, temperature coefficient of the latter, thermoelectric force and range of temperature of each couple compiled for elements of Cu/constantan, Fe/constantan, Ag/constantan, Ni-Cr/constantan, chromel/alumel, Pt/Pt-Rh, Ir/Ir-Rh, MoFe/W, W-MoFe/W, C carborundum, C/W, and for metallic and ceramic protective tubes. Temperature measurements for gases, liquids and solids are briefly described. 5 references. Ha (9b)

9c. Fatigue Testing

H. F. MOORE, SECTION EDITOR

The abstracts appearing under this heading are prepared in co-operation with the A.S.T.M. Research Committee on Fatigue of Metals. The purpose of this cooperation is to make readily available complete references to the literature on this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor.

The **Fatigue of Cast Iron.** J. W. DONALDSON. *Foundry Trade Journal,* Vol. 55, July 2, 1936, pages 9-11. Cast Fe has a relatively higher endurance limit or fatigue strength in relation to its tensile strength, when compared with other metals and alloys, an endurance ratio of 0.45 to 0.60 being obtained (but this range is not appreciably greater than that for some rolled ferrous metals. H.F.M.) The fatigue strength is not increased in high-duty irons or by alloy additions except in so far as the ultimate tensile stress is increased, an equally high endurance ratio being obtained with medium and low grade irons. Brittle cast irons both alloyed and unalloyed have been found to have endurance ratio above the average values. The ratio of fatigue strength to compressive strength varies between 0.13 and 0.15 and the ratio of fatigue strength to modulus of rupture approximates to 0.26. The effect of surface finish on the endurance limit of cast iron is small. The effect of grooving or notching in decreasing the fatigue strength of cast iron is very much less than that obtained for most other materials, and high-duty cast irons show the effect of notching to a much greater extent than do medium or low quality irons, due to their finer distribution of graphite. Understressing cast Fe for a considerable period increases the endurance limit to a greater extent than similar understressing on steel. Cast Fe retains its fatigue strength at elevated temperature better than its ultimate breaking strength and at a temperature over 600° C. the fatigue strength has been found to exceed the static tensile strength. (Note by H. F. M.: The results of tests of notched cast iron specimens, and the marked effect of understressing cast iron are in harmony with results obtained in other laboratories, notably at the Universities of Wisconsin and Illinois.) AIK (9c)

Some **New Fatigue Testing Machines.** J. S. G. PRIMROSE. *Transactions Manchester Association of Engineers,* 1934-35, pages 147-152. Some new developments in testing of bending fatigue, torsional fatigue and pulsator fatigue are briefly described. Ha (9c)

9e. Spectrography

L. W. STROCK, SECTION EDITOR

High Purity Ingot Metal. WILLIAM E. MCCULLOUGH. *Metal Industry,* New York, Vol. 33, Aug. 1935, pages 274-275. Spectograph is used in control of ingot production with a gain in quality and accuracy of analysis. Supplies of "secondary" metals are checked for presence of harmful impurities by this method. Spectographic analyses give quick and accurate results on small percentages of impurities in wrought Al alloys as limited by certain specifications. CBJ (9e)

The Estimation of Grain-Size in the Region above 10^{-3} Cm. R. A. STEPHEN & R. J. BARNES. *Journal Institute of Metals,* Vol. 60, Nov. 1936, pages 593-604, (Advance Copy No. 755). X-ray methods proposed for determining grain sizes above 10^{-3} cm. are critically examined. To be generally applicable such methods must use the same specimens as are used for microscopic examination. This necessitates the use of back-reflection methods, except for thin sheets. A new method for determining a value for average grain size solely from X-ray results is described. It involves comparison of density of spots from two separate patterns. An empirical method for determining average sizes from a graph is considered. The graph is derived by plotting spots on a given (hkl) reflection against the grain size of standard specimens. JLG (9e)

Practical Possibilities in Spectroscopic Analysis. GEORGE R. HARRISON. *Metals and Alloys,* Vol. 7, Nov. 1936, pages 290-296. Stages in spectroscopic analysis are preparation of sample, excitation of sample to emit light, analysis of the light and measurement of the intensities of this light recorded on a photographic film. Various elements act differently according to voltage of arc used for exciting light. Gases and elements like C, S and Se require higher voltages for their excitation. Elements requiring high voltage are difficult to excite in the presence of others excited at lower potential. Advantages of the diffraction grating for analysis of the light emitted are discussed. WLC (9e)

10. METALLOGRAPHY

J. S. MARSH, SECTION EDITOR

The Calculation of Precise Lattice Constants from X-Ray Powder Photographs. M. U. COHEN. *Zeitschrift für Kristallographie,* Vol. 94, July 1936, pages 306-310. In English. The method recently described by the author for eliminating the effect of systematic errors in powder photographs, has its utility increased by the use of short methods of computation. It is shown that in most cases the weights of the unknowns may be found without extra labor, and that when correctly computed the various possible estimates of error of the lattice constants are all equally valid and useful. The possibility of selecting an optimum set of reflections is discussed, and the difficulties of such a procedure are emphasized. WH (10)

Experimental or Numerical Elimination of Errors in Debye-Scherrer Photographs (Experimentelle oder rechnerische Fehlerelimination bei Debye-Scherrer-Aufnahmen?) A. IEVINS & M. STRAUMANIS. *Zeitschrift für Kristallographie,* Vol. 94, Apr. 1936, pages 40-52. A new method of precision determination of lattice constants of powder photographs is briefly described. It is pointed out that a minimum of labor is required to determine all necessary correction factors from the film. The lattice constants of TlCl, As_2O_3 and $Pb(NO_3)_2$ are critically considered. It is shown that Cohen's formulas for the determination of lattice constants are furnishing good results in only exceptional cases and are in most cases completely inapplicable. WH (10)

Investigation of Pb-alloys for Cable Sheath. K. SIMBA. *Sumitomo-densen-iho,* April 1936, pages 16-70. In this investigation the equilibrium diagram of Pb-Sb alloys on the Pb side was determined by thermal analysis and measurement of electric resistance. The solid solubility of Sb in Pb decreases from 2.5% at 250° C. to 0.5% at 60° C. Age-hardening properties of these Pb-alloys were examined in the alloys extruded, quenched, and aged, and it was found that the max. strength after aging was obtained in the alloy containing 2.5% Sb, but the alloy containing 0.25% Sb did not show any change after aging 1 yr. When the alloy containing 1% Sb was quenched from 225° C. in water, aging occurred completely, but if it was quenched in water or oil at 100° C., no hardening effect was observed. The author explained why Pb alloy containing more than 1% Sb is difficult to extrude, by the incomplete equilibrium reaction during solidification and consequently the appearance of eutectic reaction. The alloy containing 0.8% Sb did not show such difficulty. Alloys containing more than 0.02% Ca showed age hardening and this effect was observed in the 0.1% alloy Ca. The annealing temperature of 0.04-0.05% Ca-Pb alloys is about 200° C., which is 50° C. higher than 1% Sb-Pb alloy. The mechanical properties of these alloys are superior to those of 1% Sb-Pb alloys. HN (10)

Interatomic Linkages in the Metal Lattice and in Intermetallic Compounds (I legami interatomici nei reticoli metallici e nei composti intermetallici) G. M. SELLA. *Alluminio,* Vol. 5, Mar.-Apr. 1936, pages 46-54. Review of recent theory. AWC (10)

Study of Dilatometric and Magnetic Properties of Quenching Substantially Eutectoid Common Steels Particularly in Molten Tin at 300°-325° C. (Contribution à l'étude des particularités dilatométriques et magnétiques de la trempe des aciers ordinaires sensiblement eutectoides et notamment de la trempe dans l'étain fondu à 300-325) J. SEIGLE. *Revue de Métallurgie,* Vol. 33, June, 1936, pages 353-361. Specimens were quenched in water and drawn and quenched in Sn at 300°-325° C. The properties obtained were compared dilatometrically, magnetically and by hardness determination. The state of metal after these treatments was found to be different, which is attributed to the state of dispersion. JDG (10)

Thin-walled Gray Iron and Its Wear Resistance, with Particular Consideration of Piston Rings (Dünnwandiger Grauguss und sein Abnutzungswiderstand, mit besonderer Berücksichtigung der Kolbenringe) M. v. SCHWARZ. *Giesserei,* Vol. 23, May 22, 1936, pages 257-262. A review of materials used for gray Fe subject to great wear, and of experiments and practical experience which show that a resistant material should have a uniformly pearlitic structure and not contain free ferrite; a uniform and not too wide mesh of phosphide eutectic increases the wear resistance. Graphite distribution should not be too coarse, but the graphite should not be present in too fine (eutectic) distribution as in this case a dendritic phosphide net may occur which has a low wear resistance. Ha (10)

The Fracture of Pig-Iron and Cast-Iron. A. L. NORBURY & E. MORGAN. *Foundry Trade Journal,* Vol. 54, June 11, 1936, pages 453-455. The 2 chief elements which affect the fracture are C and Si. P has an effect similar to Si in reducing the solubility of C. The higher the C in a given composition, the coarser the graphite flakes, and the more open the fracture. The production of open- or close-fractured pig irons depends on the burden and operating conditions in the blast furnace. The good qualities associated with the name cold-blast Fe seem to be due to the irons being relatively low in C. The difference in the mechanical properties of irons of the same chemical analysis may be due to difference in the size of the graphite flakes. The authors have found that the change from the coarse graphite to the fine graphite structure may be produced by dissolving a small amount of ferrotitanium in molten cast Fe and oxidizing it by bubbling CO_2 gas through the molten metal. Only about 0.2% Ti is necessary, and ferrosilicontitanium is the most easily dissolved ferroalloy. Ti slag inclusions in the metal have a remarkable effect in producing the fine graphite, sooty fractures. On remelting there is a tendency for other slag particles to form in the metal and remove the effect of the original ones, and consequently to obliterate the original type of fracture. AIK (10)

Effect of Solidification Conditions on the Primary-crystal Formation of Gray Iron (Einfluss der Erstarrungsbedingungen auf die Primärkristallausbildung des grauen Gusseisens) P. TOBIAS & K. CASPER. *Giesserei,* Vol. 23, Apr. 24, 1936, pages 201-205. Freezing can produce 2 different types of crystals, depending largely on the cooling conditions. Recent investigations have shown that cast Fe follows the same crystallization laws as established for other metals and alloys. Graphite segregates only after formation of the primary crystals which determine the location of the graphite. As the Mn sulphides arrange themselves on the principal and secondary axes of the dendrites the secondarily formed graphite laminae are oriented perpendicularly to the dendrites. Sulphur prints show that the primary crystals arrange themselves also in cast Fe according to the heat flow. The method of testing and expressing the results is explained in detail. Ha (10)

Age-hardening of Aluminium Alloys. A. M. TALBOT & JOHN T. NORTON. *Aluminium & the Non-ferrous Review,* Vol. 1, June 1936, pages 412-416. See *Metals & Alloys,* Vol. 7, July 1936, page MA 365L/3. JCC (10)

Silicon Cast Irons (Les fontes au silicium). H. THYSSEN. *Revue de Métallurgie,* Vol. 33, June 1936, pages 379-389. Ternary diagram Fe-C-Si was studied in the light of physical properties obtainable. A comprehensive investigation showed that in any case when heat resistance was improved the physical properties of the Fe were badly affected. JDG (10)

The Preparation of Metal Specimens for the Microscope. R. C. STOCKTON. *Metallurgia,* Vol. 14, July 1936, pages 57-58. Methods of preparing metallographic specimens are briefly discussed. JLG (10)

Grain Changes on Annealing Cast Alpha Copper Solid Solutions. M. P. SLAVINSKI, O. S. MALKHASIAN & L. P. EDELSON. *Metallurg,* No. 3, 1936, pages 8-15. In Russian. Brasses with 30, 37 and 40% Zn and bronzes with 0.2% P and 4.5-6% Sn were annealed at 820°-850° C. for up to 50 hours. Brasses were protected from Zn loss by a coating of liquid glass, alumina and asbestos. Recrystallization of cast metals, determined miscroscopically, is possible, but it calls for about 10 hours previous preparation at the temperature for elimination of the influence of liquation produced during solidification. Recrystallization is more pronounced in alloys approaching limits of solid solubility because some volume changes in liquation products among the grains can take place in them. There are no interfering substances between the grains of cast metals. (10)

X-Ray Analysis of Crystal Orientation in Eutectic Melts of Zinc and Cadmium. D. M. ZAGORODSKIKH. *Tzvetnuie Metallui,* No. 7, Aug. 1935, pages 114-120. Author studied a eutectic alloy of 83% Cd and 17% Zn. Eutectic single crystals were obtained by withdrawing molten metal from a crucible by means of a Cu wire. Debye photograms taken of pure Zn and Cd and of eutectic single crystals led to the conclusion that the unit cells of Cd and Zn in the eutectic single crystals possess definite orientation with respect to each other, the relative positions being in the direction [100]. BND (10)

Initial Stages of the Magnetic and Austenite Transformations in a Carbon Steel. I. N. ZAVARINE. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 120, *Iron & Steel Division,* 1936, pages 253-258. See *Metals and Alloys,* Vol. 7, Mar. 1936, page MA 142L/4. (10)

Transformation Kinetics of Austenite. Comparison of Magnetization and Electric Resistance Isotherms of a Self-hardening Steel (Zur Umwandlungskinetik des Austenits. Vergleich von Magnetisierungs- und Widerstandisothermen eines selbsthärtenden Stahls. V.) F. WEVER & K. HILD. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 18, 1936, pages 43-49. The isothermal austenite conversion of a Cr-Ni steel was simultaneously determined magnetically and by measuring the electrical resistance between 610° and 200° C. It was found that in this temperature range, the change of resistance precedes the change of magnetization with a well defined dependence on temperature. This difference in the two changes must be explained by a change in the resistance of the austenite preceding the conversion. Ha (10)

Method for Simultaneously Taking Electron Diffraction Patterns of Two Samples (Eine neue Methode zur Aufnahme von Elektrogrammen bei gleichzeitiger Durchstrahlung zweier Proben) V. WERZNER. *Physikalische Zeitschrift der Sowjet-Union,* Vol. 9, No. 5, 1936, pages 549-550. In German. A broad band of electrons passes through 2 samples and the resulting diffraction waves are kept separated by a brass screen. Diffraction patterns of Ag and Te investigated simultaneously are reproduced. WH (10)

Austenite Transformation in Chromium-silicon Steel (Silcrome). S. S. STEINBERG, V. I. ZUZIN & I. A. GOLDIN. *Kachestvennaia Stal.,* Vol. 4, No. 7, 1936, pages 37-40. In Russian. Specimens containing 0.35% C, 0.35 Mn, 3.13 Si, 8.92 Cr, 0.14 Ni were soaked at 1100° C., cooled in the quenching bath at 700° to 150° C. and transferred to a magnetometer in which they were kept at the same temperature for different times. These tests were supplemented by hardness determination and microscopic examination. Austenite in this steel is very stable in the interval 550°-220° C. (martensitic point); 10 hours at that temperature produces no decomposition. Austenite decomposes at 650°-850° C. within 2-3 hours and in one hour at 700°-850° C. Martensitic point of the steel as at 120°-300° C. depending on the temperature to which the metal was heated before quenching, and soaking temperature. Holding both primary and residual austenite at 600° C. raises the martensitic point apparently on account of precipitation of submicroscopic carbides. (10)

A Self-Recording Apparatus for Thermal Analysis. R. L. WILCOX & J. R. BOSSARD. *Metals and Alloys,* Vol. 7, Sept. 1936, pages 221-224. Describes furnace, control and recording devices for thermal analysis. Sensitivity of ±1° C. is obtained with heating and cooling rates adjustable to about ½° to 2° C./min. WLC (10)

Revealing the Austenite Grain Size of Steel. J. R. VILELLA & E. C. BAIN. *Metal Progress,* Vol. 30, Sept. 1936, pages 39-45. Disadvantages of the McQuaid-Ehn carburizing method for austenitic grain size determination are cited, and the arrested transformation method developed by the author and his associates is described. See *Metals and Alloys,* Vol. 5, Nov. 1934, page MA 536. WLC (10)

The Sodium Cyanide Metallographic Etch Test for Revealing Precipitated Carbides in the 18-8 Type Stainless Steels. W. B. ARNESS. *Transactions American Society for Metals,* Vol. 24, Sept. 1936, pages 701-720. Electrolytic etch of 18-8 in 10% water solution of NaCN using 6 volts from dry cells results in etch of carbides without attack of austenite or the grain boundaries. Discussion by one of the author's associates brings out the fact that the etch also attacks sulphides in the free machining grades. WLC (10)

Precipitation Hardening of Iron-cobalt-tungsten Alloys (Die Ausscheidungshärtung austenitischer Kobalt-Wolfram-Eisen-Legierungen) H. CORNELIUS & F. BOLLENRATH. *Metallwirtschaft,* Vol. 15, June 19, 1936, pages 559-568. The precipitation hardening of 3 austenitic alloys containing about 40% Co, 40% W, and 20% Fe, was studied by Brinell measurement, metallographically, and dilatometrically. The maximum hardness of about 60 Brinell-C is attained by aging at 650° C. Various quenching and cooling procedures prior to aging, as well as cold work, had little influence on this value, though they affect its rate of attainment slightly. The lower hardness reached at high annealing temperatures is due to resolution of θ in γ. Complete softening is possible at 900°. GD (10)

Rapid Method of Developing Austenite Grain-Size. CHARLES Y. CLAYTON. *Metal Progress,* Vol. 30, Sept. 1936, page 70. Describes procedure for grain-size determination by short carburization, 2 hr. in propane at 1700° F. followed by slow cooling, iced brine or molten salt bath quenching. All methods of cooling result in a structure from which grain-size deductions are comparable with those of the longer McQuaid-Ehn Test. WLC (10)

The Structure and Physical Properties of Thin Metals on Solid Surfaces. E. N. DA C. ANDRADE & J. G. MARTINDALE. *Philosophical Transactions Royal Society of London, Series A*, Vol. 235, Aug. 21, 1935, pages 69-100. The tests involve a detailed microscopic examination of the structure of sputtered films which can furnish information on the local variations of structure which other methods cannot supply. The work deals with films of Ag from 30 to 100 atoms thick. The results are of 2 classes: (1) a series of changes in the heated films have been established which are quite independent of the nature of the non-metallic supporting surface and involve the mobility and mode of crystallization of the metal; (2) alignments of the minute crystalline particles have been found which are highly characteristic of the supporting surfaces and furnish evidence for the existence of submicroscopic surface cracks in certain types of amorphous and of crystalline substances. The second class throws light on the question of crystal flaws which account for the weakness of the natural as distinct from the ideal crystal lattice. The study includes a discussion of the preparation of the films, the effect of heat on them, the growth of the aggregates on heating, the influence of the supporting surface, and the effect of Hg on Ag films. MAB (10)

X-ray Study of Iron-nickel Alloys. ERIC R. JETTE & FRANK FOOTE. *Transactions American Institute of Mining & Metallurgical Engineers*, Vol. 120, *Iron & Steel Division*, 1936, pages 259-276. Includes discussion. See *Metals and Alloys*, Vol. 7, June 1936, page MA 311R/1. (10)

X-ray Study on the Constitution of Iron-silicon Alloys Containing from 14 to 33.4 Per Cent Silicon. EARL S. GREINER. & ERIC R. JETTE. *Metals Technology*, Sept. 1936, *American Institute Mining & Metallurgical Engineers Technical Publication* No. 744, 9 pages. Alloys were prepared from specially purified Si and electrolytic or carbonyl Fe by melting in vacuum. Specimens were heated at long times at elevated temperatures, quenched, and then used for X-ray diffraction. The Fe_3Si_2 phase, which forms by reaction between α and FeSi at 1030° C., decomposes at or close to 825° C. into α and FeSi. The Fe_3Si_2 phase is thus stable only between 825° and 1030° C. The solubility limits of Si in Fe between 600° and 1150° C. were determined and found to be different from those found by previous investigators. The solubility of Si in Fe increases from 15.2% at 600° C. to 20.4% at 1030° C. For temperatures from 1030° to 1150° C. the solubility limit is approximately constant at 20.4% Si. See *Metals and Alloys*, Vol. 4, Aug. 1933, page MA 248. JLG (10)

Polymorphism, Principally of the Elements, up to 50,000 kg./cm.² P. W. BRIDGMAN. *Physical Review*, Vol. 48, Nov. 1935, pages 893-906. A new technique is described by which pressures of 50,000 kg./cm.² and more may be applied to solids, and the parameters of any transitions measured. A systematic examination has been made for polymorphism of many of the elements in the new pressure range. New modifications are found for Bi, Hg, Tl, Te, Ga, and I_2, and the transition parameters measured. A beginning has been made of a systematic study of polymorphism of compounds, and results obtained for KCl, KBr, and KI, which presumably assume the CsCl type of structure at about 20,000 kg./cm.² WAT (10)

New Method for Determining the Curie Point of Ferromagnetic Materials (Eine neue Methode zur Bestimmung des Curiepunktes ferromagnetischer Substanzen) LUDWIG BERGMANN. *Physikalische Zeitschrift*, Vol. 37, Aug. 1, 1936, pages 547-548. Paper before the Deutsche Physikalische Gesellschaft, Halle, June 1936, describes a differential method with photographic recording. Curves obtained on Ni are reproduced and the new device is illustrated. WH (10)

Unusual Dendrites in Sheet Steel. ALFRED BOYLES & M. L. SAMUELS. *Metals & Alloys*, Vol. 7, Sept. 1936, pages 232-238, 242. The presence of small dendrites in the central portion of large grains of box-annealed low-C sheet steel is reported. It is noted that none occur in grains smaller than about 0.02" in dia. and that their formation is probably facilitated by very slow cooling. N_2 is practically eliminated as a cause. Evidence tends to the belief that the dendrites are composed of Fe_3C. The dendrites appear in certain planes as needles and as the characteristic tree shape in planes at right angle to those of the needle-shaped appearance. A relation to the aging of low C steel is suggested. WLC (10)

Notes on Etching and Microscopical Identification of the Phases Present in the Copper-zinc System. J. L. RODDA. *Metals Technology*, Sept. 1936, *American Institute Mining & Metallurgical Engineers Technical Publication* No. 746, 5 pages. A method is described whereby γ and ε may be identified by anodic etching in 17% CrO_3. At current densities over 1.5 amps./in.² γ is attacked and ε not attacked. At lower current densities the reverse is true. η is attacked under both conditions. JLG (10)

An Apparatus for Conveniently Taking Equi-Inclination Weissenberg Photographs. M. J. BURGER. *Zeitschrift für Kristallographie*, Vol. 94, June 1936, pages 87-99. In English. Briefly outlining the shortcomings of present Weissenberg apparatus, a new instrument is introduced incorporating as many conveniences as possible. The structural features are given in detail as well as calibration charts. WH (10)

Crystal Structure of Beta-Titanium. W. G. BURGERS & F. M. JACOBS. *Zeitschrift für Kristallographie*, Vol. 94, July 1936, pages 299-300. In English. Beta Ti, which is stable above 900° C. (882 ± 20° C. according to de Boer & Fast), has a body-centered cubic structure with 2 atoms per unit cell. Its side length at a temperature only slightly above the transition point is a = 3.32 A.U. WH (10)

Preliminary Note on the Phase Relationships in the Nickel-tin System. ERICH FETZ & ERIC R. JETTE. *Journal of Chemical Physics*, Vol. 4, Aug. 1936, page 537. The investigation of the Ni-Sn system has been extended beyond the limit of solubility of Sn in Ni previously reported by the authors. At the composition Ni_3Sn, the phase next to the Ni solid solution occurs, in a very narrow composition range. This phase is in equilibrium with another having a typical Ni arsenide structure between 25 and 37.5 at. % Sn. The Ni arsenide structure first appears alone at 37.5 at. % Sn, but extends as an homogeneous phase only up to 45 at. % Sn, requiring, therefore excess Ni atoms to stabilize the lattice. At 40 at. % Sn(Ni_3Sn_2) a new phase forms from the arsenide-like phase below 500° C. with a diffraction pattern closely related to the latter and possibly a deformed modification thereof. The transformed phase is not found at 38 nor at 42.5 at. % Sn, indicating a very small homogeneity range. The homogeneity range of the arsenide-like structure is independent of temperature on the high Sn side but increases slightly with rising temperature on the high Ni side. The remainder of the system reveals 3 new phases provisionally called η, θ and ζ. The first 2 have narrow homogeneity ranges at 51 and 54 at. % Sn, respectively, the η phase forming by a peritectoid reaction between the arsenide-like structure and θ. The ζ phase extends between 56 and 62 at. % Sn, (although this range may be more complicated) and coexists with the Sn phase from 62 almost to 100 at. % Sn. Diffraction patterns indicate the solubility of Ni in Sn to be very low. The results differ considerably from those of earlier workers who used thermal analysis and the microscope. FPP (10)

Typical Microstructure of Some Alloy Cast Irons. M. F. SURLS & F. G. SEFING. *Metal Progress,* Vol. 30, Sept. 1936, pages 56-57. Micrographs show the effect of alloy additions on the microstructure of gray Fe of base composition 3.20% C and 2.20% Si. WLC (10)

The Transformation in the Copper-gold Alloy Cu_3Au. C. SYKES & H. EVANS. *Journal Institute of Metals,* Vol. 58, 1936, pages 255-281, plus 3 plates. Includes discussion. See *Metals and Alloys,* Vol. 7, Mar. 1936, page MA 144L/4. (10)

Diffusion in Solid Metals and its Relation to Other Properties (Diffusion in festen Metallen und deren Beziehungen zu andern Eigenschaften) W. SEITH & E. A. PERETTI. *Zeitschrift für Elektrochemie,* Vol. 42, July 1936, pages 570-579. The diffusion constants for the diffusion of Cd, In, Sn, Sb and Cu in Ag have been measured at various temperatures between 650° and 895° C. Each specimen was made by welding (750° C. for 1 hr. under 375 g. in H_2) a pure Ag rod to a rod of Ag alloy containing 2 atomic % of the metal whose diffusion in Ag is desired. Diffusion times varied from 2 to 29 days at temperatures held at ±2° to ±5° C. in 1/3 atmosphere of N_2. Those samples containing metals that vaporize at these temperatures were first Ni plated and then Cr plated. Spectrographic methods were employed for analysing the concentration of the solute metal at various distances from the initial plane. At no time was the concentration of the solute metal greater than its solubility limit in Ag. The relations between the diffusion constant D and the absolute temperature T are, for the various metals in Ag:

$$\text{Cd} \quad D = 4.18 \times e^{-\frac{22350}{RT}}$$

$$\text{In} \quad D = 6.3 \times e^{-\frac{24400}{RT}}$$

$$\text{Sn} \quad D = 6.75 \times e^{-\frac{21400}{RT}}$$

$$\text{Cu} \quad D = 5.13 \times e^{-\frac{24800}{RT}}$$

$$\text{Au} \quad D = 9.6 \times e^{-\frac{26000}{RT}}$$

$$\text{Sb} \quad D = 4.58 \times e^{-\frac{21700}{RT}}$$

From previous diffusion measurements of the metals from Au to Bi in the sixth period and from Ag to Sn in the fifth period, in Pb it may be concluded that self diffusion (Pb in Pb) is the slowest process. For stranger atoms the diffusion is greater the further the diffusing metal is from Pb in the periodic table. This behavior may be explained by the variations in atomic size and valence of the solute atoms. For the Ag alloys self diffusion (Ag in Ag) is also the slowest process. Analysis of the data indicates that the atomic size of the solute atom is more important in determining the diffusion velocity in Ag than it is in Pb. HAS (10)

Effect of Grain Boundaries on the Deformation of Test Rods Consisting of Several Large Crystals (Untersuchung über den Einfluss der Korngrenzen auf die Verformung von Probestäben, die aus mehreren grossen Kristallen bestehen) GERHARD SEUMEL. *Zeitschrift für Kristallographie,* Vol. 93, Mar. 1936, pages 249-284. The aim was to study analytically the effect of grain boundaries on plastic deformation by progressively bridging the gap between single crystals and fine-grained metallic material. A method has been evolved to study Al rods built up by several large crystals. The evaluation of the formulae covering the analytical treatment of distortions of curves scratched upon the metal surface encountered difficulties due to the previous assumptions on the mechanism of double gliding. A new hypothesis, which satisfactorily expresses the measurements, is introduced. Investigation of the deformation of the individual crystals by measuring the distortions of networks scratched into the surface showed that the nature of deformation in the vicinity of grain boundaries is substantially the same as in single crystals. The flow of metal close to the grain boundaries is "not disturbed but only retarded." The formation of flow lines has been thoroughly studied. New flow lines at the grain boundaries could not be observed. The density of the flow lines stays constant with increasing amounts of deformations, but decreases on approaching the grain boundaries. WH (10)

Surface Magnetization and Block Structure of Ferrite. W. C. ELMORE & L. W. MCKEEHAN. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 120, *Iron & Steel Division,* 1936, pages 236-252. Includes discussion. See *Metals and Alloys,* Vol. 7, July 1936, page MA 363L/5. (10)

11. PROPERTIES OF METALS AND ALLOYS

Contributions to the Chemistry of Germanium. Part 17. The Electrochemical Behavior of Germanium (Beiträge zur Chemie des Germaniums. 17 Mittellung. Ueber das elektrochemische Verhalten des Germaniums). ROBERT SCHWARZ, FRITZ HEINRICH & ERIKA HOLLSTEIN. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 229, Oct. 27, 1936, pages 146-160. Ge potential is not obtainable with electrolytic Ge due to inconstant, unreproducible e. m. f., easily oxidized surface and H_2 content. Current density-voltage curves were obtained. Ge alone is not quantitatively deposited from solution electrolytically, also not together with Cu, Sb, Zn. From an alkaline oxalate solution under certain, constant conditions it is deposited quantitatively with Sn. WB (11)

Molybdenum and Nitrogen (Molybdän und Stickstoff). A. SIEVERTS & G. ZAPF. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 229, Oct. 27, 1936, pages 161-174. Mo sheet and wire (1400° C. annealed wire) absorbs small amounts of N_2 between 900° and 1200° C. The structure and bend ductility of the wire is not changed thereby, but the sheet recrystallizes and becomes brittle. A hitherto unknown nitride phase results when un-annealed Mo wires are heated to high temperatures in N_2 and cooled in N_2. The unannealed wires become brittle, X-ray shows 30.5-33.0 atomic % N_2 similar to β phase described by Högg. The 35.7% atomic % N_2 nitride shows the γ prase. WB (11)

The Atomic Weight of Tungsten (Das Atomgewicht des Wolframs. Analyse des Wolframhexachlorids) O. HÖNIGSCHMID & W. MENN. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 229, Oct. 6, 1936, pages 44-64. Details give at. wt. = 183.92. WB (11)

A Property of Synthetic Resins. N. A. DE BRUYNE & J. N. MAAS. *Aircraft Engineering,* Vol. 8, Oct. 1936, pages 289-290. High internal damping and energy absorption determined for fabric reenforced with phenol-, urea-, formaldehyde resins with tests on the materials in form of weighted oscillating strips. Values found for materials are compared with those for wood, steels and pure metals. It is considered that materials of high internal damping ability may have higher impact properties as a consequence. WB (11)

11a. Non-Ferrous

A. J. PHILLIPS, SECTION EDITOR

Elastic Modulus, Elastic Limit, Limit of Shear Resistance in the various Alloys of the Duralumin Type (Modulo d'Elasticita, Limite Elastico, Limite di Suervamento nelle varie Leghe del Tipe "Duralluminio") M. PREVER. *Industria Meccanica,* Vol. 18, Aug. 1936, pages 485-489. 4 different Al alloys (one with 0.7% Si, 0.6% Mg, 0.15% Cr, one with 2.4% Cu, 0.7% Si, 1.6% Mg, 1.2% Ni, 0.06% Ti, a third with 4.25% Cu, 0.75% Si, 0.75% Mg, 0.75% Mn, the fourth with 0.9% Cu, 12.5% Si, 1.2% Mg, 0.9% Ni) were examined. The elastic limit was highest in the first with 25 kg./mm.², as was also shearing strength (29.2 kg./mm.²); only No. 3 had a higher tensile strength, 40 kg./mm.² The values for the other alloys except the fourth were not very much lower. Brinell hardness was highest (120) in the third, while it was lowest (105) in the first. Complete test curves are given. Ha (11a)

Electrical and Optical Investigation on the Transformation of Non-Metallic Antimony into Metallic Antimony (Elektrische und optische Untersuchungen über die Umwandlung von unmetallischem in metallisches Antimon) R. SUHRMANN & W. BERNDT. *Physikalische Zeitschrift,* Vol. 37, Mar. 1, 1936, pages 146-149. Sb vapors were condensed in a vacuum on quartz cooled with liquid N. The transformation of nonmetallic into metallic Sb was observed at 270°-325° abs. WH (11a)

Influence of High Deformations and Annealing Temperature Preceding Deformation on Mechanical Properties of Copper Strips. S. A. KUSHAKEVICH. *Metallurg,* Vol. 11, Aug. 1936, pages 53-62. In Russian. Results of an investigation covering the influence of reduction and temperatures of annealing. No definite results were obtained. (11a)

Metals of the Platinum Group. R. H. ATKINSON & A. R. RAPER. *Journal Institute of Metals,* Vol. 59, May 1936, pages 207-234 (Advance Copy No. 734). Presents up-to-date metallurgical information on the 6 metals of the Pt group. Gives brief description of discovery of the metals and their occurrence in ores. Particular attention is devoted to recovery and refining of metals produced from the Canadian Ni ores. Methods of fabrication are described. Pt and Pd are readily worked, while Rh and Ir are worked with much greater difficulty. Rh and Os, belonging to the hexagonal system, have not been thoroughly investigated. Properties of the metals and their uses are given. 44 references. JLG (11a)

Investigation of the Tensile Properties of Solid Mercury and a Comparison with those of Other Metals at Low Temperatures. C. H. LANDER & J. V. HOWARD. *Proceedings Royal Society,* Series A, Vol. 156, Aug. 17, 1936, pages 411-426. The investigation deals with the strength of Hg at its freezing point and the results are compared with those of several other metals (Pb and Zn) and alloys at similar temperatures (17° to —130° C.). The test pieces of Hg were 1" in diameter and 3½" long, and tests were of 2 seconds duration. The load in extension diagrams of solid Hg were found to have the same characteristics as those of other metals, i.e., an elastic line, a curve of plastic deformation, and a final drop to fracture. Hg, like other metals, is strengthened by fall in temperature and the strengthening is greater the lower the temperature. MAB (11a)

The Resistance and Thermoelectric Properties of the Transition Metals. N. F. MOTT. *Proceedings Royal Society,* Series A, Vol. 156, Aug. 17, 1936, pages 368-382. The author shows that the theory of electrical conduction gives an account of some of the thermoelectric properties of these metals and alloys. Explanations are given in terms of the quantum theory of the following phenomena: The decrease in the temperature coefficient of resistance of Pd and Pt at high temperatures; the large negative thermoelectric power of Pt and Pd; the increase in the absolute magnitude of the thermoelectric power of Pd when it is alloyed with Cu, Ag, Au, or H, and the sudden drop for higher concentrations; the sudden change in the temperature coefficient of resistance of ferromagnetic metals at the Curie temperature; the behavior of the thermoelectric power of Ni near the Curie temperature. MAB (11a)

Research in Tungum Alloy. B. C. LAWS. *Shipbuilder & Marine Engine-Builder,* Vol. 43, Aug. 1936, pages 442-444. The complete mechanical properties of Tungum, a Cu-Zn base alloy are given in its hard rolled, soft, and cold forged conditions. The alloy is also stated to be diamagnetic, to have a specific resistance 4 times that of Cu, an electrical conductivity 25% that of Cu, a coefficient of expansion of 0.0000188/° C. between 0° and 300° C., a thermal conductivity of 0.184 at 100° C., and a fatigue limit of 12.5 tons/in.^{2} in air and 11.0 tons/in.^{2} in sea-water for 20 x 10^6 reversals. Laboratory corrosion tests in sea-water are given for a period of 900 hours, and tests on Tungum wire rope before and after two years' exposure in wind and sea-water. JWD (11a)

Relation of Temperature to Crystal Plasticity (Zur Temperaturabhängigkeit der Kristallplastizität) E. OROWAN. *Zeitschrift für Physik,* Vol. 102, Aug. 18, 1936, pages 112-118. By mathematical analysis author claims that Becker's theory fits the plastic deformation at room temperature of Cd, Bi and Sn crystals. FHC (11a)

Aluminum-Lead (Aluminium-Blei) WILLI CLAUS. *Aluminium,* Vol. 18, Nov. 1936, pages 544-545. Molten Al and Pb do not mix very well, but when emulsified about 5% Pb is absorbed by the liquid Al. According to DRP 265924, an alloy with 11% Pb is "hard and firm"; DRP 45052 describes an alloy of Al with 1.4% Pb and additional Mn, Zn, Sn and P that is resistant to moisture. Al with up to 20% Pb is a bearing metal if the Pb content is within the range permitting an emulsion of the Pb in the Al melt during melting and solidifying. Ha (11a)

The Magnetic Susceptibilities of the Silver-lead, Silver-Antimony, and the Silver-Bismuth Series of Alloys. G. O. STEPHENS & E. J. EVANS. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Vol. 22, Sept. 1936, pages 435-445. Magnetic tests are described and the results discussed with reference to their bearing on the structure of the alloys. All Ag-Pb alloys are diamagnetic, as are the Ag-Sb alloys; a compound Ag_3Sb exists at nearly 73% Ag. For the system Ag-Bi, the equilibrium diagram of Petrenko was in general confirmed with the existence of a solid solution of Bi in Ag extending to a concentration of 5.7% Bi. 14 references. Ha (11a)

Properties and Alloys of Beryllium. LOUIS L. STOTT. *Metals Technology,* Aug. 1936, *American Institute Mining & Metallurgical Engineers Technical Publication* No. 738, 17 pages. Properties of Be are described. History of development of both ferrous and non-ferrous alloys containing Be is reviewed. Properties of useful alloys are described. Master alloys of Be with Cu, Ni or Fe are sold in this country at prices from $30 to $40 per lb. of contained Be. Alloys of Be with light metals have not proved commercially useful, but growing uses are found for small additions of Be to Cu and Ni alloys. 42 references. JLG (11a)

Corrosion-resistant Aluminum Casting Alloys (Korrosionsbeständige Aluminium-Gusslegierungen) R. STERNER-RAINER. *Aluminium,* Vol. 18, Sept. 1936, pages 408-415. A list of Al alloys manufactured at present, their mechanical properties, resistance to chemical attack, manufacturer and country of manufacture, and chemical composition is compiled and the particular fields of their application discussed. 28 references. Ha (11a)

11b. Ferrous

V. V. KENDALL, SECTION EDITOR

Influence of Cold Deformation and Subsequent Annealing on Magnetic Properties of Soviet Armco Iron. A. S. ZAIMOVSKI & L. SH. KAZARNOVSKI. *Kachestvennaia Stal,* Vol. 4, No. 7, 1936, pages 41-45. In Russian. Wires made of open hearth steel containing 0.040% C, 0.015 S and traces of other impurities were used as samples. They were cold reduced within a wide range and annealed at different temperatures in N and H_2. Annealing after 0.5-3% deformation reduces residual induction to 4500, while greater deformation raises it to 17,500 gauss. H annealing for one hour at 850°-1000° C., specimens deformed 45%, lowers the coercive force of specimens to 50-60% of that obtained after mill annealing, but the same annealing in N reduces it only 20% (11b)

Acoustic Studies of Some Non-Transforming and Transforming Special Steels at Low Temperatures. MARY D. WALLER. *Proceedings Royal Society,* Series A, Vol. 156, Aug. 17, 1936, pages 383-393. Discusses a simple acoustic method to study the persistence of vibration of transversely vibrating metal bars at different temperatures. The vibration frequencies have also been determined. Experiments were made between —183° C. and room temperature, and the results compared with those of Hadfield, Dewar-Hadfield and DeHass-Hadfield on maximum stress, elongation, yield point, reduction of area, and Brinell hardness, of the same steels (Swedish charcoal iron, 2.5% Cr steel, Ni-Mn steel, 57% Ni steel, 18 Cr-8 Ni steel, "Elinvar" Mn steel, 31% Ni steel, 25% Ni steel). The results of tests according to the method used show that during transformation from austentic to martensitic Ni steel the internal damping is greatly increased and Young's modulus of elasticity is considerably decreased. Hadfield steel (12.69 Mn, 1.27 C) has a maximum modulus at about —50° C., which is not present when the C content of this steel is low. MAB (11b)

Iron-Manganese-Aluminum Alloys with High Permeability and Low Coercivity. B. G. LIPSHITZ & O. N. ALTHAUSEN. *Kachestvennaia Stal,* Vol. 4, No. 2, 1936, pages 25-31. In Russian. Steels with the composition: 0.06% C, 4.02 Mn, 3.53 Al; 0.19 C, 3.00 Mn, 2.75 Al; 0.04 C, 2.70 Mn, 1.75 Al; 0.10 C, 5.46 Mn, 3.57 Al were melted in induction furnace in air atmosphere. They forged easily at 800°-950° C. Annealed in H_2 at 1100° C. and measured ballistically the bars of steel showed that during the first interval of annealing, 5-10 hours, the coercive force drops quite pronouncedly, during continued annealing it decreases but much more slowly. The lowest H_c obtained with these steels were 0.24, 0.24, 0.80, 0.10 in the order corresponding to the above analyses when they were annealed in H_2. Annealed in air at 1100°-1250° C. for 7 hours the same steels gave minima of 0.38, 0.26, 0.70, 0.30 oersteds. Permeability increases with the reduction of coercive force, but while longer annealing reduced the latter, permeability decreases after reaching a maximum. The steel has 1.5 times greater resistance than 4% Si transformer steel, 0.8 ohm/mm.^{2}/m. (11b)

Honda Improves Magnet Steels. HERBERT LEOPOLD. *Automotive Industries,* Vol. 75, July 25, 1936, pages 106-107. An improvement over K. S. magnet steel has been made by development of 4 new types that are cheaper than the original alloy. One group containing 3-50 Ni, 1-50 Ti, 1-60 Co, less than 50% Mn or W or both, remainder Fe, may have a magnetic induction of 6100-8100 gausses and a coercive force of 650-750 oersteds. A second group with similar properties is of similar composition except substitution of Al or Cu or Ag or combination for Mn or W; a third group consists of Fe containing one or more of Mn, V, Mo, and W, the aggregate of these not exceeding 20%; a fourth group contains Fe and not over 20% total of Ag, Cu, Al or As. BWG (11b)

12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

H. C. CROSS, SECTION EDITOR

The abstracts in this section are prepared in co-operation with the Joint High Temperature Committee of the A.S.M.E. and the A.S.T.M. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor.

High Temperature Properties of Nickel-Cobalt-Iron Base Age-Hardening Alloys. CHARLES R. AUSTIN. *Transactions American Society for Metals,* Vol. 24, June 1936, pages 451-480; Sept. 1936, pages 481-518. Includes discussion. The study covers the base alloy Konal (73% Ni, 17% Co, 10% FeTi), K42B alloy (46% Ni, 25% Co, 19% Cr, 10% FeTi), 80-20 Ni-Cr and 18-8 Cr-Ni steel and modifications of the base alloy. 31 alloys were studied. At elevated temperatures high Fe alloys are strong but brittle. Max. tensile strength at 600° C. was obtained with 80% Co. Under certain conditions and when either Ni, Co or Fe are absent, Ti additions may result in precipitation hardening. Raising Fe and Co appears to increase precipitation hardening at 600° and 700° C. Ti seems to be unique in imparting age-hardening to ternary or modified alloys. Si, Zr and V have no such effect. Work hardenability of 18-8 is outstanding but temperature softening occurs more readily than with K42B. The alloys show superior resistance to HCl but attack is progressive even after 16 days. After 24 hr. little loss of weight in HNO_3 is observed for alloys containing Cr. Data show the importance of Cr in resistance to high temperature oxidation. Many are better than 18-8 but at 1100° C. (2010° F.) only those alloys containing Al are superior to 80-20 NiCr. Microstructures are illustrated and discussed. Data are given on electrical resistivity of many of the alloys. 15 references. WLC (12)

Behavior of Five Cast Irons in Relation to Creep and Growth at Elevated Temperatures. H. I. TAPSELL, M. L. BECKER & C. G. CONWAY. *Foundry Trade Journal,* Vol. 54, May 14, 1936, pages 381-385; May 21, 1936, pages 406-408. Extended abstract of paper before the Iron & Steel Institute. See *Metals & Alloys,* Vol. 7, Oct. 1936, page MA 507R/3. AIK (12)

Phenomena Accompanying Oxidation of Copper in Air at 500-800° C. S. P. GVOZDEV. *Metallurg,* Vol. 11, May 1936, pages 57-60. In Russian. Abnormalities recorded by many investigators on kinetics of Cu oxidation in this range were investigated. Heating Cu in air at 550-750° C. leads to formation of a Cu_2O layer consisting of acicular crystals which gives to the metal a black velvety appearance. The black color is only an optical effect; individual crystals are transparent and have a reddish tint. Velvety pile so produced is difficult to remove; rubbing only flattens it, giving to the metal grayish color of CuO. Heating in H_2 reduces it to red Cu. Heating above 800° C. in air fuses the needles, covering the metal with gray CuO. Heating Cu already covered with gray oxide in air at 700° C. forms acicular crystals under the scale. They eventually reach the surface and cover the metal with black velvety deposit. (12)

· **Effect of Heat Treatment below A_1 on the Properties of Black Heart Malleable (Influence des Traitements Thermiques au-dessous de A_1 sur les Propriétés de la Malléable a Coeur Noir)** MAURICE LEROYER. *Bulletin de l'Association Technique de Fonderie,* Vol. 10, May 1936, pages 173-177. Paper presented at the Foundry Congress in Lille, 1936. Heating to temperatures below 750° C., as in galvanizing, sherardizing, welding, grinding, etc., frequently produces brittleness in malleable castings. Tensile strength increases, elongation is lowered, hardness is unchanged, no anomalous structures are visible under the microscope, Fry's reagent does not show evidence of precipitation hardening, but the resilience or shock resistance of the metal is greatly decreased. Quenching from 650° C. prevents the development of these properties when subsequently heated at lower temperatures. Mo and Cu tend to prevent this change in the physical properties of malleable at low temperatures. WHS (12)

13. CORROSION AND WEAR

V. V. KENDALL, SECTION EDITOR

Theoretical Principles and Practical Application of the Various Processes of Phosphate Rust Protection (Theoretische Grundlagen und praktische Durchführung der verschiedenen Phosphatrostschutzverfahren) R. JUSTH. *Korrosion & Metallschutz,* Vol. 12, Aug. 1936, pages 202-208. The different processes of Coslett, Parker, Bonder and others are briefly described. The reaction mechanism in the phosphate treatment is principally that the Fe is caused, by the action of H_3PO_4, to form on its own surface tertiary insoluble ferrophosphate: $Fe + 2H_3PO_4 = Fe(H_2PO_4)_2 + H_2$, $Fe(H_2PO_4)_2 + H_2O = FeHPO_4 + H_3PO_4$. Chemical apparatus for this treatment is described. All phosphate layers can now be successfully combined with oils, fats and lacquers, and with metallic and enamel coatings. Ha (13)

Corrosion of Iron and Steel. R. A. HADFIELD & S. A. MAIN. *Journal Institution of Civil Engineers,* 1935-36, June 1936, pages 3-100; discussion pages 101-126. Modern researches on corrosion are reviewed and statistical analysis is made of the 5-year results obtained in the research work of the Sea-Action Committee of the Institution. See *Metals & Alloys,* Vol. 7, Oct. 1936, page MA 509L/4. JWD (13)

The Webb Rust-Proofing Process. *Engineering,* Vol. 142, July 24, 1936, page 89. Describes method developed by Webb Metal Treatment, Ltd., London. Process is electrolytic and consists in impregnating articles to be treated with a non-corrosive alloy. Treated articles may be bent, twisted or hammered without the coating blistering, peeling or cracking. Salt-spray tested for 3 weeks coated article showed no signs of corrosion. VSP (13)

Boiler Failures and their Causes. Deduction from British Investigations. *Commonwealth Engineer,* Vol. 23, Feb. 1, 1936, pages 221-223. Based on the 1933/34 Technical Report of the Royal Insurance Co. Ltd., an analysis is made of some boiler failures of types that have given much concern to manufacturers and operators during recent years. WH(13)

Unusual Boiler Problems caused by Corrosion. CYRUS WM. RICE. *Combustion,* Vol. 8, Aug. 1936, pages 31-34. O_2 corrosion in boilers, condensate return lines and accessory equipment can be prevented where the feedwater treatment in use is non-deposit forming and such as to eliminate protective coatings of Ca and Mg compounds over the water-exposed metal surfaces. The use of Na_2SO_3 as an inhibitor of O_2 corrosion is discussed, as is also the employment of catalytic agents to increase removal of O_2 from water. ERK (13)

Influence of Nitrogen of the Air on the Wear-corrosion and Fatigue Fracture (Die Mitwirkung des Luftstickstoffs beim Fressen und beim Dauerbruch) H. SCHOTTKY & H. HILTENKAMP. *Technische Mitteilungen Krupp,* Vol. 4, June 1936, pages 74-79. See *Metals & Alloys,* Vol. 7, Oct. 1936, page MA 508R/7. Ha (13)

The Cause and Prevention of Steam Turbine Blade Deposits. F. G. STRAUB. *Mechanical World & Engineering Record,* Vol. 100, July 24, 1936, pages 79-80, 86; July 31, 1936, pages 104-105, 112. Data were collected by the University of Illinois Engineering Experiment Station from many generating stations, and a theory is developed as to the formation of blade deposits. To test the theory, steam from a small boiler was contaminated and allowed to impinge on a stationary blade. WH (13)

A Note on the Influence of Salt-bath Heat-treatment on the Corrosion-resistance of Duralumin Sheet. A. J. SIDERY & B. EVANS. *Journal Institute of Metals,* Vol. 59, June 1936, pages 259-265 (Advance Copy No. 737). Accelerated corrosion tests indicated that heating in a salt bath for quenching did not influence corrosion resistance. JLG (13)

A Study of Oxide Films on Metal Surface with Cathode Ray Diffraction. Copper and Its Alloys. SHIZUO MIYAKE. *Scientific Papers Institute of Physical & Chemical Research,* Tokyo, Vol. 29, July 1936, pages 167-179. In English. See *Metals & Alloys,* Vol. 7, Mar. 1936, page MA 151L/6. WH (13)

Action of Solutions of Sodium Silicate and Sodium Hydroxide at 250° C. on Steel under Stress. W. C. SCHROEDER & A. A. BERK. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 120, Iron & Steel Division, 1936, pages 387-403; *Engineering,* Vol. 141, May 22, 1936, pages 573-574. See *Metals & Alloys,* Vol. 7, May 1936, page MA 261R/7. VSP (13)

Corrosion-protective Value of Electrodeposited Zinc and Cadmium Coatings. W. BLUM, P. W. C. STRAUSSER & A. BRENNER. *Electrometallurgy,* supplement to *Metal Industry,* London, Vol. 48, May 29, 1936, pages 615-618, June 5, 1936, pages 639-643. 19 references. See *Metals & Alloys,* Vol. 7, Sept. 1936, page MA 469L/1. HBG (13)

Heat Resisting Castings. Cr-Ni-Fe Alloys. J. D. CORFIELD. *Metal Progress,* Vol. 30, Oct. 1936, pages 191-194. Graphs show design strengths applying to 24 Cr-12 Ni, 28 Cr-10 Ni, 18 Cr-8 Ni, and 35 Ni-15 Cr and 65 Ni-15 Cr. These design stresses are based upon service experience in actual installations. Casting design is discussed. WLC (13)

Oxygen Corrosion of Boilers in Relation to Temperature, Pressure, Soda Content, and Boiler Construction (Sauerstoffkorrosion an Dampfkesseln in Abhängigkeit von Temperature, Druck, Natron-Zahl und Kesselkonstruktion) CHRISTMANN. *Die Wärme,* Vol. 59, Mar. 28, 1936, pages 225-230. Information on oxygen corrosion scattered in the international literature is critically discussed and classified. The various factors concerned are pointed out, and structural and chemical advice is given with the view of counteracting oxygen corrosion of boilers. WH (13)

Some New Wear Tests. HANS DIERGARTEN. *Metal Progress,* Vol. 30, Sept. 1936, pages 74, 76. Experiments with sliding wear are described indicating that microstructure is more important than hardness. The size and aggregation of carbide particles increase wear resistance. WLC (13)

Corrosion by Combustion Gases (Korrosion durch Rauchgase) ERNST GENTE. *Die Wärme,* Vol. 59, May 2, 1936, pages 307-311. The effect of the humidity of combustion gases upon corrosion is discussed. The H_2O-content of the S-bearing gases is calculated for combustion gases. Construction and operation of a dew point indicator are described. WH (13)

14. APPLICATION OF METALS AND ALLOYS

Bimetallic Cylinder Heads. *Automotive Industries,* Vol. 75, Sept. 12, 1936, page 361. A new type cylinder head provides greater power and fuel economy by making possible the use of compression ratios as high as 7.75. Dynanometer tests show 17% increase in power and a 10% decrease in fuel consumption over the Al head. The bimetallic engine head consists of two parts. Either Al or cast Fe may be used for the upper section, forming the water jacket. The lower or combustion chamber section is constructed of a high strength Cu alloy with a heat conductivity of 2½ times that of Al. CMH (14)

Selection and Applications of Cast Metals to Machine Conostruction. GARNET P. PHILLIPS. *Journal Western Society of Engineers,* Vol. 41, Aug. 1936, pages 187-201. A brief discussion of the properties and some of the present applications of the cast metals now obtainable. 4 classes of cast metals discussed are: cast steels, malleable irons, gray irons and special alloy irons, and non-ferrous cast metals. Tables show the composition and property ranges of cast C steel, alloy cast steels, malleable cast irons, cast irons, and cast non-ferrous alloys. WHB (14)

Role of Metals in New Transportation. *Metals Technology,* Oct. 1936, 102 pages. A symposium conducted by American Institute Mining & Metallurgical Engineers, Feb. 1936. **Problems of American Railroads Early in 1936** is by J. J. PELLEY. **The Heavier Nonferrous Metals in Transportation** is by C. H. MATHEWSON. **Light-weight Metals in the Transportation Industry** is by ZAY JEFFRIES. **Trends in the Metallurgy of Low-alloy, High-Yield-Strength Structural Steels** is by H. W. GILLETT, and contains 59 references. **Structural Steels and Light-weight Metals in the Transportation Industry is by** HORACE C. KNERR. **Proposed Use of Alloys in Merchant Shipbuilding** is by EDGAR P. TRASK. **Mutual Effects of Metallurgy and Speed in the Automotive Industry** is by MERRILL C. HORINE. **The Railroad and Light-weight Equipment** is by W. W. COLPITTS. JLG (14)

Nickel Alloys in Japanese Industry. YASUSHI TAJI. *Engineer,* Vol. 161, May 1, 1936, pages 467-468; May 8, 1936, pages 493-494. Outlines the recent developments in the use of Ni alloys in Japanese industries with some references to European and American developments. VSP (14)

Copper and Mild Steel Fire Boxes (Kupferne und flussstählerne Lokomotivfeuerkisten) FRITZ WILDE. *Die Wärme,* Vol. 59, May 2, 1936, pages 311-313. The pros and cons of Cu are critically discussed. Previous experiences with mild steel fire boxes are considered with the view of helping German manufacturers to go over to mild steel. WH (14)

Recent Trends and Developments in Chemical Engineering. EDITORIAL STAFF REPORT. *Chemical and Metallurgical Engineering,* Vol. 43, Aug. 1936, pages 419-423. Notable points from papers presented at the Chemical Engineering Congress in London are given. Materials for steel forgings for handling fluids at high temperatures and pressures are indicated. Other steels for pressure vessels, corrosion resisting metals, and plastics are mentioned. PRK (14)

Steel Cars Rebuilt into "Train of Tomorrow." *Steel,* Vol. 99, July 20, 1936, page 19. Brief description of the "Mercury" of New York Central system. Cars were reconstructed from light-weight suburban passenger coaches, plain C steel sheets and plates being used for bodies. Paneling ceilings, fixtures and much of furniture required 18 tons of Al and its alloys. Kitchen has 5 tons of stainless steel. Locomotive has a 1200-lb. low-C steel stream-lined hood. MS (14)

Molded Plastic Housing Combined with Metals in Redesigned Meat Chopper. *Steel,* Vol. 99, Aug. 17, 1936, pages 43-44. Old style electric chopper, largely of gray-Fe castings, weighed 115 lbs. Use of molded plastic hood and Zn-base die-cast base and front cover plate reduced weight to 95 lbs. Cylinder is cast of gray-Fe containing 20% Ni and later Cr plated. Meat pan is Cu and Cr plated sheet steel. Motor is mounted in a steel frame. Helical gears of steel containing 3½% Ni and 1% Cr drive machine. Gear-case and feed-screws are of gray-Fe. Active parts of mold for producing plastic-housing are of steel containing 3½% Ni and 1% Cr. After rough machining, steel is heated to 1300° F., cooled slowly, finish machined, carburized at 1650° F. for 8 hrs., cooled slowly to 700° F., quenched in oil, tempered for several hrs. at 375° F., ground, and polished. MS (14)

Compression-Ignition Engines for Rail Traction. H. D. BUSH. *Journal Institute of Fuel,* Vol. 9, June 1936, pages 334-338. Materials of construction and life of various parts are discussed. AHE (14)

The Influence of Operating Experience on the Design and Construction of Turbines and Alternators. CLAUDE DIXON GIBB. *Journal & Transactions Institution of Engineers of Australia,* Vol. 8, July 1936, pages 241-258. This paper, based on the author's personal experiences in operating and manufacturing, is partly devoted to metallurgical problems such as fatigue testing of turbine members, blade corrosion and its prevention, and an appendix gives "specifications to govern the manufacture of rotor forgings for turbines and high speed alternators." States that a material having a fatigue strength in air of ±18 tons/in.², may, under corrosive conditions, have a fatigue limit of ±1 ton/in.² A chart shows the fatigue testing results for the same class of steel when tested in air, $MgCl_2$ (spray) and HCl. A first quality high speed tool steel with 18-22% W will give complete immunity from erosion when fitted as a shield to a mild steel blade. WH (14)

Concentrated Heating. F. BAXENDALE. *Electrical Review,* Vol. 119, Aug. 7, 1936, page 174. Describes several types of elements for electrical heating. Rod type consists of Ni-Cr resistance spiral centered in an outer metallic sheath from which it is insulated. Sheath material is varied to suit application, such as tinned Cu for H_2O heating; mild steel and Monel metal for oil immersion; Alumbro for air heating; mild steel for soft metal melting; and stainless steel for radiant heating at high temperatures. Cartridge insert heater consists of resistance wire contained in a brass tube from which it is insulated. For low-temperature work, wire on mica elements incased in sheet-metal covers are used. Loop resistors consist of Ni-Cr, or other suitable alloy, wound upon insulating supports. Strip and slab heaters are constructed of resistance wire embedded in an insulating powder or paste and incased in sheet-metal covers. MS (14)

Plating Equipment—Materials of Construction. EDWIN M. BAKER. *Metals and Alloys,* Vol. 7, Nov. 1936, pages 287-289, 296. Materials for tanks for various types of plating solutions, methods of anode contact and ventilating equipment for plating rooms are described. WLC (14)

14a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

Molybdenum—A Metal for Vacuum Tubes. T. G. TROXEL. *Radio Engineering,* Vol. 16, Dec. 1936, pages 8-9. A brief outline of the means of obtaining Mo for radio receiving tube construction. In Mo wire the crystals should be in the form of long parallel threads, closely interlocked. In sheet the crystals should be like tiny plates matted together with all flat surfaces parallel to the faces of the sheet. Physical and chemical properties are discussed. WHB (14a)

Potential Difference between Various Kinds of Metals Applied in Oral Cavity and their Physiologic Effects. EIJIRO WAKAI. *Journal American Dental Association,* Vol. 23, June 1936, pages 1000-1006. The author studied 9 precious metals, 24 dental alloys, and 8 amalgams in combinations with Zn and among themselves to determine potential difference and stimulation. The following conclusions were drawn: (1) A metal in a tooth acts as a positive pole and its presence causes the generation of Ca at that pole; (2) when the metal in the tooth acts as the negative pole, H_3PO_4 is liberated; and (3) when 2 contiguous teeth, or 2 corresponding upper and lower ones, contain different metals, they are liable to destruction. OEH (14a)

New Al-Zn-Pb Antifriction Alloys (Nuove leghe antifrizione a base di Al-Zn-Pb). V. BIROLI. *Alluminio,* Vol. 4, July-Aug. 1936, pages 144-149. A series of alloys containing Al-Zn-Pb (composition not given) have been developed. These LIASA alloys (Leghe Italiane Antifrizione Speciale e Autolubrificanti) have excellent characteristics as bearing metals, i.e. low coefficient of friction, higher melting point than the Sn-base bearing metals, but lower than that of bronzes, and with a hardness which is intermediate between the bearing metals and bronzes; the specific gravity is also lower, only 6.05. They are easily workable. AWC (14a)

14b. Ferrous

M. GENSAMER, SECTION EDITOR

Making and Testing Saw-Mill Saws made of Carbon-Silicon-Chromium Steel. *Kachestvennaia Stal.* Vol. 4, No. 6, page 55. In Russian. Saws made of steel containing 0.9 C, 0.4 Mn, 1.67 Si, 1.15 Cr drawn at 640°-670° C. had much longer life and better cutting characteristics than C-Cr-V saws. (14b)

The New Steel Tone Tape Machine. *Electrical Communication,* Vol. 15, July 1936, pages 62-69. Translated from *Lorenz Berichte,* Jan. 1936. Describes the construction of machine for magnetic recording of sound on a steel tape 3 mm. wide by 0.08 mm. thick and discusses the fundamental principles involved in erasing and recording. JCC (14b)

Nickel Steels and Alloys in Aircraft Engines. *Aero Digest,* Vol. 29, July 1936, pages 38-39, 110. Comprehensive review with data. WB (14b)

Ultra-Modern House Built of Steel. ROBERT BINGHAM. *Iron Age,* Vol. 138, Aug. 6, 1936, pages 40-41. Describes a 2 story all steel house constructed by National Houses, Inc., New York. House is assembled of cold rolled, Cu-bearing sheets. Outside walls are 14-gage, in widths of 2 ft. and 4 ft. Structural clamps hold together the panels. The price of the house is about $10,000 and contains 10 tons of steel. VSP (14b)

Powdered Metals. A. B. EVEREST. *Foundry Trade Journal,* Vol. 54, Apr. 23, 1936, page 329. A short paper competition entry to the London branch of the Institute of British Foundrymen. Most metals can be produced in the form of fine powder and today a number of methods for this purpose have been developed. The powdered metals are used extensively in the production of paint, as abrasive and also with or without heat-treatment for certain electric and magnetic applications. They are also used, mixed with suitable binder, as coatings for welding rods. Of greater immediate interest, however, is the use of powdered metals as a raw material or an intermediate product in the manufacture of various special articles. The manufacture of components in such metals as W, Mo, etc., production of semi-metallic forms, application of powdered metals in connection with permanent magnets, etc., are discussed by the author. It is mentioned that the production of more massive parts from powdered W has recently become of industrial importance in the manufacture of bombs for shielding radium. In this case the bomb is made up from powdered W, to which is added a small proportion of Ni and Cu. After pressing to the desired shape the whole is sintered at a low temperature thus forming a dense metallic unit. AIK (14b)

Cold Drawn Expanding in Utility. *Metal Progress,* Vol. 30, Oct. 1936, pages 115-116, 124. Discussion of increased application of cold drawn bars. 5 references. WLC (14b)

Stainless of the 18-8 Variety. *Metal Progress,* Vol. 30, Oct. 1936, pages 241-248. Cost factors are discussed and use of bimetal materials for economy. Cold rolled properties are tabulated showing material of tensile strength 150,000-225,000 lbs./in.^{2}. Reviews fundamental changes in composition particularly as regards use of Mn as a substitute for Ni in attaining an austenitic composition. Corrosion mechanism is briefly discussed. Welding practices and use of stainless for building construction are described. WLC (14b)

Prestressed Steel Unique Feature of Concrete Tanks. *Compressed Air Magazine,* Vol. 41, June 1936, page 5061. An unusual feature of certain concrete storage tanks is the reinforcing steel, which has been prestressed, making possible the support of considerable loads by relatively thin shells and the elimination of cracks resulting from tension and shrinkage. The method of prestressing is described, and the recent trend toward higher tensile-strength steels in reinforcing is discussed. FPP (14b)

The House Trailer Boom. Its Market Possibilities for Metal Products. FRANK J. OLIVER. *Iron Age,* Vol. 138, Aug. 20, 1936, pages 32-37; Aug. 27, pages 34-37, 94. An analysis of present trends in automobile trailer construction. Uses of steel in construction are in chassis, frame work of tubing and steel sides and roof frames made of T-sections arc welded together. There seems to be no trend toward the use of all steel bodies. Some of the arguments against use of all steel bodies are: (1) Steel is too heavy; (2) steel conducts and attracts heat too easily; (3) if body is scraped it shows ugly rust spots; and (4) steel is more difficult to repair in the event of an accident. Includes a selected list of trailer manufacturers and construction material they use. VSP (14b)

Loops in Wire Ends Easily Stressed Beyond Safety. W. H SWANGER & G. F. WOHLGEMUTH. *Metal Progress,* Vol. 30, Aug. 1936, pages 59-67, 82, 84, 86, 88, 90, 92. Discussion by Ernest Thum. The failure of heat treated suspension bridge cable wire has been investigated. Failure is explained as due to high residual stresses in the loops around the anchorages. The heat treated wire lacked sufficient ductility possessed by the ordinary cold drawn wire to give plastically and readjust the stressed condition. The superposition of small alternating stresses is claimed to be sufficient to cause the wire to fail. WLC (14b)

Changing Trends in the Use of Steel. WALTER H. VOSKUIL. *Mining Congress Journal,* Vol. 22, Sept. 1936, pages 61-63. A summary of applications of steel in building construction; railroads; automobile industries; oil, water and gas machinery; in containers, and in minor industries. BHS (14b)

Forging Chromium Steel Valves. A. G. AREND. *Metallurgia,* Vol. 14, Sept. 1936, page 144. Cites advantages of Cr steel for forged valves. JLG (14b)

Alloys used in the Manufacture of Permanent Magnets (Leghe impiegate nella fabbricazione dei magneti permanenti) R. B. DUPUIS. *Alluminio,* Vol. 4, July-Aug. 1936, pages 137-143. A summary. An Al-Ni steel which can be heat treated so that it can be machined has been recently introduced. AWC (14b)

Cast Camshafts and Cams for Automobiles (Arbres à Cames et Vilebrequins coulés pour l'Automobile) G. DUBERCET. *Revue de Fonderie Moderne,* Vol. 30, Aug. 10/25, 1936, pages 235-240. Very satisfactory results have been obtained in using cast pieces instead of forgings. They were more economical in material, cost less in machining, were lighter, and did not require any heat treatment. The composition of the Fe in this case was 1.35-1.6% C, 0.6-0.8% Mn, 0.85-1.1% Si, 1.5-2.0% Cu, 0.4-0.5% Cr, 0.1% max. P, 0.6% max. S. The charge consisting of 50% steel scrap and 50% scrap of the same cast Fe was melted in the electric furnace. The castings were heated for 20 min. at 900° C. in a gas furnace, cooled in air to 650° C., reheated for 1 hr. to 800° C., and finally cooled in 1 hr. The tensile strength of this material is about 75 kg./mm.^{2}, elastic limit 65 kg./mm.^{2}, elongation 2.5-3%, Brinell hardness 269. Ha (14b)

15. GENERAL

Examining the Foundry of Tomorrow Through the Spectacles of Imagination. HERBERT M. RAMP. *Iron Age,* Vol. 137, Apr. 30, 1936, pages 26-28. States that in the foundry of the future melting methods will be radically changed and temperature control will be on a par with precise control of mixture. Cupola will become obsolete and melting processes will be accomplished by electricity or gas. Patterns for a number of castings will be made from some material that can easily be formed to desired shape. Dull Fe will be unnecessary. Sand mixing as well as several other operations will be improved. VSP (15)

Annual Report of the Metallurgical Division, Fiscal Year 1935. Progress Reports—Metallurgical Division. No. 12. R. S. DEAN. *United States Bureau of Mines, Report of Investigations,* No. 3306, June 1936, 39 pages. The work of the Bureau along the following lines is summarized: Metallurgical fundamentals, low-temperature specific heats, thermodynamics of Cr reduction, density of cold-worked metals, heats of fusion, metal carbonates, direct production of steel, explosive shattering, magnetic properties of minerals, electrical properties of minerals, gas absorption on minerals, dust settling, oil emulsions in flotation, chemistry of flotation, flotation of non-sulphide minerals, flotation in brine, elutriation, agglomeration and tabling, tabling a brine pulp, innovations in ball milling, size preparation of Fe ores, desulphurization, flotation of Au and Ag minerals, use of fatty acids as collectors for coated Au, flotation of scheelite, coated Au, Au in pyrite, Cu metallurgy, etc. AHE (15)

On After-Effects Produced on Metal Surface by Cathode-Ray Bombardments or by Low Pressure Gas Discharges. MITIO HATOYAMA & MOTOHARU KIMURA. *Bulletin Institute of Physical & Chemical Research,* Tokyo, Vol. 15, Aug. 1936, pages 681-691. In Japanese. *Scientific Papers & Abstracts Institute of Physical & Chemical Research,* Tokyo, Vol. 29, Aug. 1936, pages 36-37. In English. Experiments with Zn, Cu, Al, Cd, Ag, and Mg. WH (15)

A Suggested Method for Preparing Deliquescent Tin Dross Samples. J. B. KASEY. *Metal Industry,* New York, Vol. 34, Sept. 1936, page 338. Dry powdered soda ash is added to the deliquescent dross and by double decomposition with the chlorides of Sn present moisture inert compounds are formed. Laboratory samples can be prepared from 25-50 lb. smelter samples. CBJ (15)

Zircon. H. CONRAD MEYER. *Foote Prints,* Vol. 9, June 1936, pages 1-9. History, properties, source-deposits and analysis discussed. Industrial applications cited. WB (15)

Tubes Help Make Automobiles. R. A. POWERS. *Electronics,* Vol. 9, June 1936, pages 22-24, 55. Phototubes, amplifiers, oscillators and microphones aid in welding, timing, titration control, and casting tests. A photo-electric scleroscope is used. Satisfactory hardness permits the hammer rebound to eclipse a light beam and provides automatic inspection and sorting for hardness. Directional microphones detect soundness of castings when struck by a slight blow. This test is used in preference to X-ray inspection. DJM (15)

Metallurgical Literature and the Technical Library. A. D. ROBERTS. *Metallurgia,* Vol. 14, July 1936, pages 77-78. Tells how to find information on metallurgical subjects. JLG (15)

Program of the Kaiser Wilhelm Institute for Metallurgical Research at Stuttgart (Arbeitstagung des Kaiser Wilhelm-Instituts für Metallforschung in Stuttgart) H. O. v. SAMSON-HIMMELSTJERNA. *Metallwirtschaft,* Vol. 15, May 29, 1935, pages 502-505. A brief survey is given of current research at the Institute. Methods for the acoustical measurement of elasticity and damping capacity and their applications to special problems, X-ray study of internal stresses, preparation of special alloys by sintering, the Al-Mg-Zn system, theory of magnetism, spectroscopic analysis of traces of impurities, statistical studies of grain size, scaling of Cu alloys, and the measurement of thermal conductivity are especially described. GD (15)

A Review of Developments in Temperature Control Equipment. *Industrial Heating,* Vol. 3, Oct. 1936, pages 645-666; Nov. 1936, pages 755-762, 792; Dec. 1936, pages 821-824, 842. Temperature measuring and temperature control devices, manually and automatically operated, and combustion safeguards are described in detail and the various commercial types illustrated. Ha (15)

15a. Economic

Work of Tractor Plants in Regard to Replacing Types of Steel. N. V. GROOM-GRJHIMAILO. *Kachestvennaia Stal,* Vol. 4, No. 5, 1936, pages 13-14. In Russian. Due to the shortage of domestic Ni many tractor plants tried to reduce the Ni content of their steels or replace them with Ni-free steels. (15a)

Coal, Iron and Steel Industries in Poland. C. B. JERRAM. *Iron & Coal Trades Review,* Vol. 133, July 31, 1936, page 177. Statistics on production, consumption and trade with other countries. Ha (15a)

The New Technical and Economic Importance of Iron and Steel Scrap. CLYDE E. WILLIAMS. *Yearbook American Iron & Steel Institute,* 1936, pages 185-221; discussion pages 221-227 *Iron & Coal Trades Review,* Vol. 132, June 12, 1936, pages 1077-1078; *Iron Age,* Vol. 137, May 28, 1936, pages 34-43; *Steel,* Vol. 98, June 1, 1936, pages 34-39, 64; *Blast Furnace & Steel Plant,* Vol. 24, June 1936, pages 502-504. Review of steel scrap, its supply, imports and exports, uses, residual metals, etc. 10 references. VVK + Ha + VSP + MS (15a)

Foundries in 1935 (Revue Général de la Fonderie dans Quelques Pays Étrangers au Cours de l'Année 1935) *Bulletin de l'Association Technique de Fonderie,* Vol 10, Feb. 1936, pages 49-60. Review of foundry conditions in Great Britain, Belgium, Czechoslovakia, the U. S. A., Germany, and Sweden during the year 1935. WHS (15a)

Mine Production of Gold, Silver, Copper, Lead and Zinc in Colorado in 1935—Advance Summary. CHAS W. HENDERSON & A. J. MARTIN. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 483, Aug. 18, 1936, 3 pages. Statistical. AHE (15a)

Mine Production of Gold, Silver, Copper and Lead in Wyoming in 1935 Advance Summary. CHAS. W. HENDERSON & A. J. MARTIN. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 487, Aug. 19, 1936, 1 page. Statistical.

Distribution of Steel in American Industries, 1935. *Engineer,* Vol. 161, May 15, 1936, pages 522-523. Deals with the consumption of finished steel products in 1935 by the various industries. Gives detailed information in tabulated form. VSP (15a)

15b. Historical

Built Early Electric Furnace. *Foundry,* Vol. 64, Sept. 1936, pages 26, 74. Presents interesting data on what is claimed to be the first electric furnace for production of gray Fe castings. According to Robert Gregg, who was connected with Hesse-Martin Iron Works, Portland, Oregon, the first furnace was built in 1917. It was built to produce synthetic cast Fe from steel scrap, chips and borings. Furnace was a plain cylindrical shell 48" in diam. and 48" high resting on a square steel plate 36" above floor. So far as operating conditions and quality of metal were concerned the furnace was a success. Castings for power transmission lines were made. Includes tables giving the analyses of typical test bars. VSP (15b)

Famous Steel Men and Engineers. JAMES WATT. *Edgar Allen News,* Sept. 1936, pages 909-912. Complete biography. Ha (15b)

Aluminum after 50 Years. *Metal Industry,* New York, Vol. 34, Feb. 1936, pages 54-59. Development of the applications of Al in the past 50 years. CBJ (15b)

A History of the American Crucible Business. JONATHAN BARTLEY. *Metal Industry,* New York, Vol. 34, Feb. 1936, pages 47-53. History of the industry from its inception in 1827 to date. CBJ (15b)

A Review of Metallurgical Progress. ALBERT SAUVEUR. *Year Book American Iron & Steel Institute,* 1936, pages 228-243. An historical review of metallurgy and metallography. VVK (15b)

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WELDING ENGINEER, metallurgical experience with sales background. Experience in design, estimating and research, sheet metal and heavy structures. Not actively employed at present. Permanent connection desired. Box MA-14, METALS & ALLOYS, 330 West 42nd St., New York, N. Y.

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POSITION WANTED—INDUSTRIAL METALLURGIST available January 1, 1937. College graduate, eleven years of practical industrial metallurgical experience in founding, semi-steel and gray iron castings up to eight tons, brass castings up to four tons. Experienced in supervision of men and electric furnaces, alloying and analysing and initiating costs sheets. Applicant 34 years of age, married. Box MA-20, METALS & ALLOYS, 330 W. 42nd St., New York.

METALLURGIST WANTED. Young man, preferably with some practical experience or training in non-ferrous metallurgy—particularly lead alloys—qualified and interested in both shop practice and development work. Location in middle west. Apply giving full particulars. Box MA-21, METALS & ALLOYS, 330 W. 42nd St., New York.

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WANTED: Pyrometer Man for sales, or sales and service. Middlewestern territory. Salary or drawing account. Fine opportunity with growing organization. Box MA-23, METALS & ALLOYS, 330 W. 42nd St., New York.

Book Reviews

MALLEABLE IRON *(La Malleable)*

Maurice Leroyer.

Dunod, Paris, 1936. Paper, 6½ x 10 in., 227 pages. Price 46.25 Fr.

The French scientific mind is particularly successful in the orderly presentation, critical study and evaluation of data and in the drawing of logical conclusions therefrom. M. Leroyer has come up to the highest traditions of his nation in the text under review. The fact that his literary style is unusually clear cut and that the book is profusely illustrated by 55 drawings and 62 micrographs brings his book well within the ready understanding of American readers having the most elementary familiarity with technical French.

Leroyer has condensed his treatment to about one-half the bulk of the standard American and German texts on the same subject. This has been accomplished largely by the omission of so-called "practical" details. As a result his work, "addressed to malleable founders, actual and prospective users of this metal and beginners in this special branch of metallurgy" is actually primarily a metallurgical text book rather than a foundrymen's hand book. It happens that this reviewer is quite in sympathy with the author's viewpoint.

Leroyer supports his statements and discussion by a well selected bibliography of 100 titles, 60 of which are American, 15 French and the remainder of British, Japanese, German, Russian and Swedish origin. This may serve to demonstrate the catholicity of the author's attitude and the wide range of his reading. The references have been brought surprisingly closely up to date of publication, references to the 1935 literature being encountered.

Since the author has so liberally availed himself of American references, it is only to be expected that the well informed American reader will be already fairly familiar with the subject matter of the text. Even to such a reader the book may, however, be very useful as a correlated abstract of the metallurgical literature of "malleable."

After an extremely brief historic and general treatment, Leroyer writes a well ordered chapter on annealing, considering together both the theory of graphitization and decarburization and thus very satisfactorily correlating the European and American products. One is somewhat surprised that the constitutional diagrams used to explain graphitization do not recognize the difference between the stable and metastable A_1 temperature; this point not being touched upon until several chapters later. No explanation is found in the text for this absence and a somewhat unusual form given to the A_{cr} line and the A_1 line of the stable system below the eutectoid concentration.

There follows a chapter on the effect of various elements, principally on the annealing properties of the metal, and another devoted to the study of heat treatment in annealing. In this chapter the author falls into a curious error. He says: "One sees that metal sufficiently rich in carbon and silicon commences to graphitize at temperatures below the A_1 transformation point. . . . On the other hand alloys poor in silicon do not commence to graphitize until higher temperatures are reached." This concept that there is a temperature below which any given iron does not graphitize and above which it does, is occasionally encountered elsewhere but few metallurgists in America would now subscribe to this view. Cementite is metastable at all temperatures; graphitization occurs, though slowly, at all temperatures. Thus Kinzel and Moore, "Graphite in Low-Carbon Steel," *Transactions American Institute of Mining & Metallurgical Engineers*, Vol. 116, page 318, reported the complete graphitization of a steel still section of low silicon and about 0.15 per cent carbon on some years of exposure below A_1. Leroyer apparently mistakes an unobservably slow reaction for equilibrium. His statement would be correct if modified to say that graphitization *at a given rate* proceeds as he states. One chapter is devoted to operating methods and even though this is the longest in the book, the author has limited himself to a very brief descriptive treatment of the various processes supplemented by significant metallurgical data.

Chapter VI discusses the mechanical, physical and chemical properties of malleable cast Fe based very largely upon the Symposium of the A.F.A. and A.S.T.M. It should be gratifying to those societies to know how completely they had apparently covered the available ground.

An unusual feature of the book is an entire chapter devoted to machinability, heat treatment, welding, brazing and surface protection. This chapter contains a rather adequate though brief description of the "pearlitic" malleable produced by recombination of C by heat treating. Here again we find an example of the "up to dateness" of the book.

Leroyer concludes his book with a chapter on alloy malleable covering the elements Al, Ni, Ti, Cu, W, Mo, V, Cr and Mn both singly and in combination. As may be supposed, some of these are of the pearlitic type. He has dealt with this subject as competently as anyone could in the existing state of knowledge, but the reader must here constantly keep in mind the very great uncertainties still existing in our knowledge.

The effect of copper, treated largely in the light of the work of Lorig is excellent and fairly complete; the effect of small amounts of molybdenum is very well covered, especially the effect on the "Marshall" or "galvanizing" embrittlement.

With regard to the other elements, except the universally present manganese, the reviewer feels that the time is not yet ripe for well matured opinion. A service has certainly been rendered in assembling pertinent facts regarding such elements. It may be expected, however, that in a relatively short time so much more will become known in this field as to make this chapter the first to require additions and revisions.—H. A. Schwartz.

REVIEW OF CURRENT LITERATURE RELATING TO THE PAINT, COLOUR, VARNISH AND ALLIED INDUSTRIES.

***Published bimonthly by Chorley & Pickersgill, Ltd.**, Amberley House, Norfolk St., Strand, London W. C. 2, Eng., for Research Assoc. of British Paint, Colour & Varnish Mfrs., price 2L, 2s per year, including index.*

This abstract journal is now on sale to the general public. While most of the abstracts relate directly to general paint and varnish matters, a section on corrosion fouling and weathering includes references dealing with metal-painting and coating problems. Patents as well as trade and technical literature are covered. The abstracts are printed on one side of the page only to allow clipping.—H. W. Gillett.

CYANIDATION AND CONCENTRATION OF GOLD AND SILVER ORES.

John Van Nostrand Dorr.

McGraw-Hill Book Co., Inc., 1936. Cloth, 6 x 9 in., 460 pages. Price $5.00.

Mr. Dorr, as he admits in his preface, felt some hesitancy in writing about an industry in which he must inevitably be considered a salesman. On the other hand, the widespread use of his company's products gives him access to much information not available to the "outside" engineer. A reader with this in mind will find much of value in the book. It contains brief, uncritical descriptions of crushing, grinding, classifying, leaching, filtering, thickening, tabling, and flotation machinery, with excellent photographs and diagrams. The chapters on examination and testing of ores, bullion recovery, and plant control, chiefly quotations from writers in *Mining and Metallurgy, Engineering and Mining Journal,* and other mining publications, are quite complete and up-to-date. Cost and flow-sheet data, many of them hitherto unpublished, from cyanide plants all over the world, are the most valuable part of the book.—John Attwood.

NAPOLEON ON THE ISLE OF ELBA. HIS METALLURGICAL STUDIES AND PROJECTS.

(Napoleone all'isola d'Elba, suoi studi e progetti siderurgici esposti in alcuni documenti inediti, interpretati 3 commentati).

A. Piccinini.

Printed for and published by the firm "Ilva," Alti Forni e Acciairie d'Italia, Genova, 1935. Paper, 8½ x 11½ in., 161 pages.

During Napoleon's exile on the island of Elba, he became interested in the possibilities of the local utilization of the island's iron ore which had long been shipped away for smelting. He corresponded with General Drouot, through the fall of 1814, raising the question whether the ore could not be smelted with local charcoal and asking for data on amounts of raw materials needed, cost of building a blast furnace, etc. In one letter he remarked that American vessels trading to Italy might well take back pig iron from such a furnace as ballast. An engineering report by Alex. Boury appraising it as feasible, was rendered on the project on Feb. 22, 1815, only 4 days before Napoleon left the island.

Today modern blast furnaces of the Societá "Ilva" exist at Portoferraio on the island and at Piombino, the nearest point on the mainland.

The original documents are reproduced and copiously annotated. Discussion of the smelting methods utilized in Napoleonic times, and an account of the development of the Italian iron industry, leading up to the establishment of the modern furnaces, are added.

The book is beautifully printed and illustrated. It is an extremely interesting piece of metallurgical history.—H. W. Gillett.

THE A.W.F. HARDENING BOOK.

(Das AWF-Härtebuch)

2nd ed. Berlin: Beuth-Verlag. 144 pages. 6 x 8. Paper cover. Price 3.10 M.

This book is divided into 7 chapters, an appendix, and is illustrated by 116 figures. Chapter I, pages 7-31, on hardening processes discusses the general principles, decarburization, cooling media and cooling velocity, depth of hardening, tempering, heat treatment, case hardening and precipitation hardening. Chapter II discusses strain, warpage and cracking in hardening and means of avoiding these difficulties. Dies, gears and the like are given considerable attention. Chapter III talks of autogenous hardening and its applications but such new American developments as hardening by induction heating are not included. Chapter IV is on hardening by working, while Chapter V is on hardening of dies. The latter chapter gives some good illustrations of failures due to design. Chapter VI is directed to hardening automobile parts such as cam shafts and gears while Chapter VII is a summary. Chapter VIII is an appendix and covers heat-treating equipment.

The treatment in all sections is largely from the practical point of view and the data and illustrations seem well chosen. This little book should be of value to the practical heat treater and to the metallurgist but its use in the States may be limited by its being written in German.—Oscar E. Harder.

WROUGHT IRON—ITS MANUFACTURE, CHARACTERISTICS AND APPLICATIONS.

James Aston & Edward B. Story.

A. M. Byers Co., Pittsburgh, 1936. Cloth, 6 x 9¼ in., 59 pages. Price $1.00.

This book was prepared to fill a definite need for a text on wrought iron. It will serve as a source of information for architects, engineers, etc., who have occasion to use the material.

It is hoped that in future editions the size of the book will be increased by the addition of more information on the properties of wrought iron, as well as the present methods of manufacture in addition to those used by the A. M. Byers Co.—Richard Rimbach.

MAGNETIC AND ELECTRICAL PROPERTIES OF IRON ALLOYS.

(Magnetische und Elektrische Eigenschaften der Legierten Werkstoffe.) **O. Von Anwers.**

Part D of the section on Iron of Gmelins Handbuch der anorganischen Chemie, 8th ed., Verlag Chemie, Berlin, 1936. 7 x 11 in., 466+48 pages, 342 figures. Price 57.75 RM.

Aside from indices, cross references to patents listed in Grützner's monograph, and a few pages of general listing of the systems of most importance in relation to particular properties, the whole book is essentially an annotated bibliography.

Over 330 pages are devoted to the magnetic properties, 65 to electrical resistance and 20 to thermoelectric properties. Each alloy composition, no matter how complex, is given a separate listing and everything published on that alloy in respect to the particular property up to September, 1936, referred to. Representative data are cited, much of it in the form of curves, often including results of a number of investigators. Thus, the aim is, if anything has been recorded on magnetic or electrical properties of any ferrous alloy, either to cite the information directly or to tell the reader where to find it.

As a finding-list for data in its field, the volume seems unsurpassed. The labor of collecting such a mass of data from the literature is colossal, arranging and indexing it is no mean task, and anyone who is faced with the necessity of locating such data, even when his library facilities are complete enough to have all the primary sources at hand, will appreciate having the collection and sorting done for him. In the absence of an ample library, such summaries are even more indispensable.—H. W. Gillett.

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE 4th edition.

Lincoln Electric Co., Cleveland, 1936. Fabrikoid, 5¾ x 9 in., 819 pages. Price $1.50 in the U. S. A., $2.00 elsewhere.

Each issue of this handbook increases in size and usefulness. 223 pages and 289 new illustrations have been added.

The book is divided into 9 parts: Part 1. Welding Methods and Equipment; Part 2. Technique of Welding; Part 3. Procedures, Speeds and Costs for Welding Mild Steel; Part 4. Structure and Properties of Weld Metal; Part 5. Weldability of Metals; Part 6. Designing for Arc Welded Steel Construction of Machinery; Part 7. Designing for Arc Welded Structures; Part 8. Typical Applications of Arc Welding in Manufacturing and Maintenance.—Richard Rimbach.

HANDBOOK OF CHEMISTRY AND PHYSICS. 21st Edition.

Charles D. Hodgman.

Chemical Rubber Publishing Co., Cleveland, 1936. Fabrikoid, 4¼ x 6¾ in., 2023 pages. Price $6.00.

Each new edition of this handbook becomes increasingly difficult to review. Of course it can be pointed out that the number of pages has been increased by 64, that 175 pages of new composition have been included, etc., but the painstaking care used in assembling so many data cannot be adequately appraised.

The reviewer has had occasion to use previous editions and found them well worth the price. Every metallurgist would do well to have this handbook alongside his A.S.M. Metals Handbook.—Richard Rimbach.

GLOSSARY OF TECHNICAL TERMS. 4th EDITION.

Intelligence Memorandum, British Aluminium Co., Ltd., London, 1936. Mimeographed, 8 x 10 in., 56 pages.

Technical phrases met in the literature on light metals are given in parallel columns in German, English, French and Italian. In another section Russian-English, and in still another Czech-English-German equivalents are shown. The phrases cover much of the essential vocabulary of metallurgy. —H. W. Gillett.

Current News Items

A. F. A. 1937 Convention and Exposition

"Enthusiastic" is the word to use in describing the attitude of exhibitors toward the Forty-First Annual Convention and Foundry Show sponsored by the American Foundrymen's Association which will be held in the Milwaukee Auditorium, Milwaukee, Wis., May 3 to 7, 1937. Present indications are that the 1937 Show will be the largest, from the standpoint of number of exhibitors, that has been held in many years—greater even than the Detroit Show last year, which was proclaimed both by those in attendance and by exhibitors as the largest and most informative convention and exhibit ever staged by A.F.A.

It is the usual custom of A.F.A., following the announcement of the place, time and character of the next convention, to mail applications for exhibit space to prospective exhibitors asking for information as to space requirements and character of exhibits. Information thus gleaned is used as a guide in laying out the Foundry Show so as to make as fine a display as possible.

Accordingly, applications for space were mailed to prospective exhibitors on Dec. 12. On December 29, over 100 per cent more applications had been received than in a similar period following announcement of the 1936 Detroit Show, many from companies which did not exhibit last year. This surely is evidence that manufacturers of equipment and supplies for the foundry and allied industries are looking forward expectantly to the 1937 Foundry Show.

A number of factors probably have influenced this enthusiastic response. Chief among them is the better business that both the foundry and equipment industries are enjoying and the desire on the part of manufacturers and dealers in foundry equipment and supplies to show their products in such an important foundry center as Milwaukee where no such opportunity has been offered since 1924, a period of 13 yrs.

Battelle Again Adds to Its Staff

Battelle Memorial Institute, Columbus, Ohio, has announced the appointment of James T. Gow as research metallurgist on the Institute staff. Mr. Gow was graduated from the University of Minnesota in 1929 and has a master of science and metallurgical engineering degree. From 1928 to 1930 he was employed by the Naval Research Laboratory as advisor on steel casting production in the Navy Yard foundries, where he was identified with the development of the Gamma ray method of inspection of steel castings.

From 1930 to the time of his coming to Battelle, he was metallurgical engineer with the International Nickel Co., where he was employed in research work on heat and corrosion resistant alloys. At the institute he will continue in metallurgical research, particularly in the fields of heat and corrosion resistant alloys, which are of special interest to the chemical industries.

Within recent months research work at Battelle sponsored by industries has so increased that the construction, now in progress, of another large laboratory building was necessary.

● Carboloy Co., Inc., Detroit, manufacturers of Carboloy cemented carbide tools, dies and wheel dressers, announces the appointment of Frederick W. Lucht to its engineering staff at Detroit. Mr. Lucht was formerly with the McCrosky Tool Corp, of Meadville, Pa., and prior to that he was connected with Goddard & Goddard Tool Co., Detroit.

The James F. Lincoln Arc Welding Foundation

Dedicated to encouragement of study and research for benefit of the arc welding industry, a significant new foundation has just been established by vote of The Lincoln Electric Co.'s directors.

This new fund has been named "The James F. Lincoln Arc Welding Foundation," in honor of the pioneer work of the company's president in promoting arc welding and in perfecting and developing arc welding equipment and electrodes. One of its primary functions will be the stimulation of original design in order that arc welding processes may be more widely utilized in modern-day fabrication.

Principal direction of the foundation's work will be given by Dr. E. E. Dreese, head of the department of electrical engineering at Ohio State University. Other trustees who will serve with Dr. Dreese on the Foundation are W. B. Stewart, distinguished member of the Cleveland Bar, and H. R. Harris, vice president of the Central National Bank of Cleveland.

Dr. Dreese is an outstanding member of the American Institute of Electrical Engineers, and has wide connections in the field of general science. His important position with the Foundation places its program on the highest possible plane, and assures the carrying out of studies which will view arc welding with full regard to both its economic and social significance.

It is expected that directors of the Foundation soon will formulate a comprehensive program, and will announce the first of their activities at an early date.

First Annual Enameler's Round Table Conference

The first annual Enamelers Round Table Conference, to be sponsored by the Porcelain Enamel Institute, will be held next May at the University of Illinois. Preliminary plans developed by F. E. Hodek, Jr., of the General Porcelain Enameling & Mfg. Co., institute vice-president in charge of the new project, and his committee, indicate the conference will be a 3-day affair and include discussions of enameling problems of interest to the entire industry. Enamelers forums and short courses formerly conducted by Ohio State University, the University of Illinois and the Ferro Enamel Corp. are to be discontinued in favor of the institute conference, Mr. Hodek has announced.

In addition to the general sessions, which will be all-industry round table discussions, the outline for a tentative program shows the conference will be divided into sectional groups which will discuss problems pertaining to the enameling of cast iron, sheet metal and hollow-ware.

● The Association of Iron and Steel Engineers will hold a national meeting Thursday, Feb. 25, in Youngstown, Ohio, in the ball room of the Ohio Hotel. There will be technical sessions in the morning at which articles on "Manufacture and Use of Rolls in the Steel Industry," "Ward Leonard Control for Blooming Mill Auxiliary Drives," and "Continuous Pickling Tank Construction" will be discussed. In the afternoon a special cavalcade of buses will transport the guests to the Campbell Works of the Youngstown Sheet & Tube Co. where they will inspect the continuous hot and cold strip mills and other late installations at this plant.

● The Wheelco Instruments Co., Chicago, has opened a Detroit office located at 6432 Cass Ave., Detroit, with James A. Harrison, engineer, in charge as district manager.

International Nickel Expands Metallurgical Staff

A. J. Wadhams, vice president of The International Nickel Co., Inc., and manager of the Development and Research Division has announced several additions to the technical staff.

Charles H. Lindsley, a physical chemist, will specialize in the application of physico-chemical methods to the study of corrosion phenomena. For the past 2 yrs. he has been connected with the Biochemical Research Foundation of the Franklin Institute in Philadelphia where he conducted research into the physical chemistry of enzyme reaction. Dr. Lindsley obtained his Ph.D. at Princeton University. He will be located at the research laboratory of the company in Bayonne, N. J.

Donald J. Reese, a foundry engineer, will carry on research work on cast iron at the company's research laboratory. Mr. Reese, who was formerly employed by the Whiting Corp., Harvey, Ill., is well known in foundry circles for his work on cupola operation. He is a graduate of the University of Michigan and holds a degree of B.S. in chemical engineering.

Frederick G. Sefing, formerly assistant professor of metallurgy at Michigan State College, will also be employed on research work in cast iron at the Bayonne laboratory. Mr. Sefing is a graduate of Lehigh University in mechanical engineering and holds a degree as Master of Science from Pennsylvania State College. He is well known in technical circles, largely because of his work on the metallurgy of cast iron.

Richard F. Barnes, Jr., will be available to industry at large for technical service on problems involved in the utilization of mill products such as Monel, nickel and Inconel for applications requiring resistance to corrosion. After graduation from M. I. T. with a degree of B.S. in chemical engineering, Mr. Barnes was engaged in laboratory studies of paper chemistry and high pressure organic syntheses. During the past 3 yrs., he has been employed on research and production work in the manufacture of organic plastics. He will operate out of the New York office.

Carl Rolle will be available to industry for consultation on mill product fabrication problems. Mr. Rolle is a graduate of Pennsylvania State College and holds a master's degree in mechanical engineering from M. I. T.

Selling World's Fair Debentures to To Non-Ferrous Industry

Fifteen leaders of the Non-ferrous Metals Industry have volunteered their services to cooperate with Cornelius F. Kelley, president of the Anaconda Copper Co., in distributing the New York World's Fair 4 per cent debentures among the members of the industry, Mr. Kelley has announced.

The volunteer committee has set an objective of $1,000,000 in subscriptions and each of the members is now actively engaged in the solicitation of a selected list of leading concerns. Similar committees have been formed in 61 other trade and industrial divisions, and a total of more than 1600 business men are now engaged in the effort to distribute $27,829,500 of debentures.

Members of Mr. Kelley's committee include F. H. Bronnell, chairman of the board of the American Smelting & Refining Co.; Louis S. Cates, president of the Phelps Dodge Corp.; Edward H. Clark, president of the Cerro de Pasco Copper Corp.; Edward J. Cornish, chairman of the board of the National Lead Co.; Clinton H. Crane, chairman of the board of the St. Joseph Lead Co.; Arthur B. Davis, chairman of the board of the Aluminum Co. of America; Cleveland E. Dodge of the Phelps Dodge Corp.; Charles Hayden of Hayden Stone & Co.; James E. Hayes, president of the New Jersey Zinc Co.; H. Donn Keresy, president of the Anaconda Wire & Cable Co.; W. O. Osborn, attorney for the Phelps Dodge Corp.; Robert C. Stanley, president of the International Nickel Co. of Canada; E. Tappen Stannard, president of the Kennecott Copper Co.; Otto Sussman, chairman of the board of the American Metals Co.; and Carl T. Ulrich, vice president and treasurer of the Kennecott Copper Co. William J. Creamer of William J. Creamer & Co., Brooklyn, will cooperate with Mr. Kelly's committee as divisional vice-chairman, soliciting the non-ferrous metal concerns in Brooklyn.

Symposiums on Corrosion Testing and on Lubricants at A. S. T. M. Regional Meeting

The Regional Meeting of the American Society for Testing Materials, held annually, is scheduled this year for Chicago during the week of March 1. Tentative plans call for morning and afternoon sessions on Wednesday, March 3. Throughout the week beginning Monday, March 1, and extending through Friday, March 5, there will be in progress the regular spring group meetings of A. S. T. M. committees. These and the regional meeting will be held at the Palmer House.

Two symposiums will feature the regional meeting—one on Lubricants and one on Corrosion Testing. The first one is sponsored by Committee D-2. This symposium will supplement a similar one held at the 1933 regional meeting in New York in 1933. The symposium on Corrosion Testing is the result of discussions in Committee A-5 on corrosion of iron and steel and B-3 in corrosion of non-ferrous metals on the matter of the society taking some steps in the direction of standardization of methods of corrosion testing. Details of the program of papers will be available later.

Decorative Metal Plaque Now Commemorates Historic South American Conference

An historic meeting which occurred more than a century ago between two victorious generals of the war for South American independence was commemorated recently by the dedication of a cast nickel-silver marker plaque. This plaque, replacing one of bronze which had become so badly corroded in the humid climate of Guayaquil as to be indecipherable, marks the spot where Generals Bolivar and San Martin discussed on July 26, 1822 the social and political problems arising from the creation of the new republics.

These two heroes of American independence, Simon Bolivar, "The Liberator" and Jose de San Martin, then "Protector of Peru," although they met but once during their lives, strived untiringly for the same ideal—the relief of South American from Spanish domination. Many years of grueling warfare were endured before this desire was realized.

Presentation of the nickel-silver marker was made to the city of Guayaquil and to the people of Ecuador by Edward F. Feeley in the presence of the Ecuadorean and Peruvian Boundary Commission. The General Bronze Co., Long Island City, N. Y., designed and cast the plaque. Nickel-silver was selected for its durability and resistance to corrosion in the moist, hot climate of Guayaquil, located near the equator at sea level.

● Acquisition of all assets and business of the U. S. Pressed Steel Products Co., Kalamazoo, Mich., by the Ingersoll Steel & Disc Division of Borg-Warner Corp., was announced today by Roy C. Ingersoll, president of the Ingersoll Division and a vice-president of Borg-Warner Corp.

The U. S. Pressed Steel Products Co. was founded more than a quarter of a century ago in Ypsilanti, Mich., moving to Kalamazoo in 1930 when it acquired the property formerly occupied by the Youngstown Sheet & Tube Co. The company has long been a supplier to the leading motor car and farm implement manufacturers. For the automobile manufacturers, it makes seat frames, hood handles, stabilizer bars, metal boxes and automobile stampings. For the agricultural implement maker the products are: Steel eveners, seats, boxes and special steel implement and tractor parts, heat treated spring teeth and special bars of all kinds for harrows, cultivators, weeders, rakes and other farm implements.

The Kalamazoo plant covers 5½ acres with modern manufacturing facilities and at present employs more than 250 men. C. V. Brown, founder of the company, and his son, R. J. Brown, of Detroit, will continue in the business under the supervision of the Ingersoll Division.

First International Electrodeposition Conference

The first International Electrodeposition Conference is to be held in London, England, March 3 and 4, 1937. It has been organized by the Electrodepositor's Technical Society. The provisional program is as follows:

WEDNESDAY, MARCH 3.

Opening Ceremony at British Industries House, followed by Luncheon.

First Session (Afternoon):

"ELECTRODEPOSITION PRACTICE ABROAD."

Second Session (Evening):

"ELECTRODEPOSITION OF BASE METALS."

THURSDAY, MARCH 4.

Third Session (Morning):

"THE PROPERTIES OF ELECTRODEPOSITS."

Fourth Session (Afternoon):

"ELECTRODEPOSITION OF PRECIOUS METALS."

Reception and Dinner.

Papers have been accepted from Belgium, Czechoslovakia, France, Germany, Holland, Russia, Switzerland and the United States of America. Papers which will be delivered by American authors are as follows:

"The Crystal Structure of Copper Electrodeposits" by Arthur Phillips, professor of metallurgy, Yale University, and Walter Meyer, electrochemist, General Electric Co., Bridgeport, Conn.

"Developments in the Electrodeposition of Platinum Metals" by Dr. K. Schumpelt, chief electrochemist, Baker & Co., Inc., Newark, N. J.

"The Cyanide-Cadmium Plating Solutions" by Dr. Gustaf Soderberg, chief chemist, Udylite Co., Detroit.

"Methods of Determining Thickness of Electrogalvanized Coatings" by Dr. A. K. Graham, assistant professor of electrochemistry, Univ. of Penn.

"Studies Evaluating the Brightness of Electrodeposits" by Dr. B. Egeberg, chief metallurgist, and N. Promisel, electrochemist, International Silver Co., Meriden, Conn.

"A Resume of Silver Plating" by Frank C. Mesle, research engineer, Oneida Ltd., Oneida, N. Y.

"Electroplating—American Practice" by George B. Hogaboom, engineer, Hanson, Van Winkle, Munning Co., Matawan, N. J.

All inquiries should be addressed to the Hon.-Conference Secretary, H. Wynne-Williams, 12A, Raleigh House, Larkall Estate, London, S.W. 8.

Tallest Steel Stack Ever Erected

Building an all-welded steel heating plant to heat its 1200-ft. factory at Peoria, Ill., R. G. Le Tourneau, Inc., manufacturers of heavy grading equipment, were confronted with the problem of constructing and erecting a smoke stack tall enough to carry the smoke clear.

Inside the plant, ¼-in. plate was pre-fabricated into an all-welded stack 104 ft. tall, 57 in. in diameter and weighing approximately 10 tons. This is thought to be the tallest pre-fabricated steel stack ever erected. The stack is anchored to the floor and roof of the boiler house, which reduces its outside height to 83 ft. A portable tractor-powered Crane of all-welded design was built to lift and place this stack and for other heavy duty. This Crane rides on six 18 by 24.00 rubber tires. It is cable controlled from a power control unit mounted on the tractor.

As used to erect this stack, a feat which it performed in 30 min., the Crane has an 84-ft. boom. However, it is reversible, the boom becoming a tongue and the 22-ft. tongue a boom, which gives it a 40-ton capacity for lifting an all-welded steel house now nearing completion in the Le Tourneau factory.

● Pierce T. Wetter, who for 10 yrs. has been on the staff of the American Society of Mechanical Engineers supervising its technical professional division, has left the society to become executive vice-president of the American Cutting Alloys, Inc., of 500 Fifth Ave., New York. In his new position Mr. Wetter will have charge of developing the American Cutting Alloys, Inc., in the manufacture and sale of cemented carbide titanium tips and cutting tools particularly for the cutting of steel at high speeds. The company plans to enlarge its program of activities which have been gradually developed during the last eighteen months. Mr. Wetter also becomes vice-president and assistant treasurer of the American Electro Metal Corp., of Lewiston, Maine, manufacturers of molybdenum and tungsten products.

● H. Boker & Co., New York, sales representatives for specialty steels, have acquired all rights to "Kinite Alloy Die Steel" including the patents, goodwill, trade name and stock. Kinite will be available as heretofore both in bars and in castings. All sales matters will be handled from the New York office and Kinite castings, formerly made at Fairmont, W. Va., will be made in Detroit. H. Boker & Co. completes its 100th yr. in business, having been founded in 1837. In addition to Kinite, the firm will, as in the past, handle Novo Superior high-speed tool steel as well as a number of other steel specialties.

● Thomas H. Wilber has recently been appointed general manager of the Bullard-Dunn Process Division of The Bullard Co., Bridgeport, Connecticut. This division engineers and licenses the use of the Bullard-Dunn Electrochemical process for the descaling of metals. Thomas E. Dunn, Jr., has also been appointed to the sales department of the Bullard-Dunn Process Division, and will have his offices at 309 Miller-Storm Building, 12015 Linwood Ave., Detroit.

● Ernest T. Fisher, well known to the industry through his more recent connection with the Illinois Foundry Co., Springfield, Ill., in the capacity of superintendent and assistant manager, has recently become associated with the Claude B. Schneible Co., Chicago, manufacturers of dust suppressing equipment. He will act in the capacity of sales engineer, covering the territory contiguous to St. Louis, working with foundries of all kinds in an effort to help reduce their dust hazard.

● Robert G. Guthrie, past president of the American Society for Metals, and consulting metallurgist for The Peoples Gas Light & Coke Co., Chicago, has been appointed chairman of the Ferrous Metals Committee of the Industrial Gas Section of the American Gas Association, according to an announcement by Ralph L. Manier of Syracuse, who is chairman of the Industrial Gas Section.

● E. S. Bissell, technical adviser on industrial application in the instrument division of the Bausch & Lomb Optical Co. since 1929, has joined the Mixing Equipment Co., Rochester, N. Y., as sales manager. Mr. Bissel's duties will also include the direction of advertising and sales promotion.

● General Refractories Co., Philadelphia, announces the appointment of H. R. Weller as district sales manager at Cleveland. Mr. Weller succeeds John C. Hopkins who has resigned to become associated with the Wellman Engineering Co.

● Edward L. Barker, 162 Glen Parkway, Spring Glen Estates, New Haven, Conn., has been appointed representative of the Ajax Electric Co., Inc., in the New England territory.

● The board of directors of Hunt-Spiller Mfg. Corp., Boston, announce the election of Edward C. Felton, vice president succeeding Frank M. Weymouth, deceased.

● Wayne L. Cockrell has been appointed to the faculty of Michigan State College, East Lansing, Mich., as instructor in mechanical engineering, teaching metallurgy.

● The Wilbur B. Driver Co., Newark, N. J., has appointed Peter M. Brown, Jr., to the position of chief chemist, and has added Arthur S. Mueller to the laboratory staff.

Manufacturers' Literature

Brass Flux

The features of this flux, for use with brass and bronze mixtures having a melting point up to 1800 deg. F., are described in a leaflet of The Maluminum Co., Indianapolis, Ind. (B 120)

Impact Tester

The Riehle "VV" variable velocity impact tester consisting of 2 separate and distinct parts: the pendulum, as a means for measuring the energy required to rupture the test specimen; and the rotatable wheel and related parts which serve to develop the necessary kinetic energy and velocity is the subject of a booklet of the Riehle Div., American Machine & Metals, Inc., New York, N. Y. (B 121)

Carbon Determinator

Construction and operation of the Leco Carbon Determinator are explained in an illustrated booklet which claims that a very accurate determination can be made in 2 min. Laboratory Equipment Corp., St. Joseph, Mich. (B 122)

Vanadium Steels

Various of these steels for locomotive and car construction are described in a booklet which also gives the complete specifications for each steel. Vanadium Corp. of America, New York, N. Y. (B 123)

Dip-Spra Bonderizing

This process which is an application of the fundamentals of Spra-Bonderizing to lesser production requirements brings the average user the lower costs of the ordinary immersion process with the more efficient, more compact coating, and reduced operating costs. Parker Rust-Proof Co., Detroit, Mich. (B 124)

Repeated Stress Machines

These machines for determining the endurance limits of bar, wire and sheet metals are described in a pamphlet of G. N. Krouse, New Kensington, Pa. (B 125)

High Temperature Creep Values of Low Priced Alloy Still Tubes

Up-to-date circular which supersedes Circular Letter No. 2A, Nov. 1, 1933, bearing the same title. The Calorizing Co., Pittsburgh, Pa. (B 126)

Current-Input Controller

Bulletin No. 136 describes this controller for use with furnaces, ovens, platens and other electrically heated units. Automatic Temperature Control Co., Philadelphia, Pa. (B 127)

Gas Analysis

Bulletin describing the thermal conductivity method of gas analysis is published by Charles Engelhard, Inc., Newark, N. J. (B 128)

Colmonoy

Bulletin No. 50 is devoted to the wear-resistant, corrosion-resistant and heat-resistant alloys and overlay metals of the Colmonoy Co., Los Nietos, Calif. (B 129)

Mallory Elkon

Looseleaf catalog containing engineering data with descriptions, illustrations and recommendations for the selection of electrical contacts for all types of service. P. R. Mallory & Co., Inc., Indianapolis, Ind. (B 130)

Foote-Prints

Interesting articles as well as information on Foote products are included in the various issues of this house organ. Foote Mineral Co., Philadelphia, Pa. (B 131)

Combination Surface and Needle Pyrometer

This instrument, combining one indicator with four different types of surface and needle pyrometer elements is the subject of leaflet No. 60-A. Pyrometer Instrument Co., New York, N. Y. (B 132)

Positive Displacement Blowers

Bulletin 22-B12 discusses the structural features of these blowers, claiming positive delivery of an accurately measured volume of air under all operating conditions. Roots-Connersville Blower Corp., Connersville, Ind. (B 133)

Magnaflux

This system of inspection is described in a colorful folder, illustrating four typical magnetizing units used in this process. Magnaflux Corp., New York, N. Y. (B 134)

Combustion Equipment

Proportioning valves for gas-air and oil-air, gas burners, oil burners and other equipment for industrial fuel burning are illustrated in a leaflet of the North American Mfg. Co., Cleveland, O. (B 135)

Corrosion and Heat Resisting Stainless Steels

This company claims that its materials are manufactured by special processes involving direct reduction of chrome ore and providing a closer metallurgical control than has been obtainable heretofore. Colorful bulletin containing type analyses. Rustless Iron and Steel Corp., Baltimore, Md. (B 136)

Electric Furnace

The Sentry Model "Y" which is described in Bulletin 1019 is offered especially for small tools, whether hardened on a production or intermittent basis. The Sentry Co., Foxboro, Mass. (B 137)

Metal Spraying

A leaflet discussing Metalayer, a process and equipment for simultaneously melting, atomizing and applying on any surface, coatings of any of the commercial metals may be obtained from the Metals Coating Co. of America, Philadelphia, Pa. (B 138)

ACF Berwick Electric Metal Heaters

Leaflet illustrating and describing this type of heaters equipped with temperature controlling devices. American Car & Foundry Co., New York, N. Y. (B 139)

Quenching Machine

In the Greene tank objects are forced apart and kept in motion, solution vigorously sweeps over the objects and cooling is equal on all sides according to a leaflet of E. G. Greene, Cleveland, O. (B 140)

Portable Tensile Tester

The manufacturer claims that this tester is a real time and money saver and specimens may be tested accurately even by the inexperienced. Detroit Testing Machine Co., Detroit, Mich. (B 141)

Meehanite Metal

A specification chart of recommended grades for various service requirements has been issued by the Meehanite Metal Corp., Pittsburgh, Pa. (B 142)

Thermal Analyzer

Laboratory furnace equipment designed to conduct grain size tests, creep tests, thermocouple calibration, etc. and also for precision heat treatment, is described in a brochure of the Stanley P. Rockwell Co., Chicago, Ill. (B 143)

Research Microscopes

Microscopes and their accessories are discussed in Catalog M66. Spencer Lens Co., Buffalo, N. Y. (B 144)

Midvaloy No. 77

An unusual oil hardening alloy steel for use in ball races, balls and bearings, taps and tapper taps, etc., is described in a leaflet of The Midvale Co., Nicetown, Philadelphia, Pa. (B 145)

Zinc Plating

Zin-O-Lyte, a process for bright zinc plating producing brilliant deposits direct from the bath without bright dipping, is the subject of a new bulletin of the Grasselli Chemicals Dept. of E. I. du Pont de Nemours & Co., Cleveland, O. (B 146)

Degreasing

The advantages of using the Detrex degreasing method for cleaning oil and grease from all kinds of metal products prior to rust proofing are given in a leaflet of the Detroit Rex Products Co., Detroit, Mich. (B 147)

MANUFACTURERS' LITERATURE

Ferrocarbo

This material containing both silicon and carbon combined in the form of silicon carbide acts as a graphitizer or softener when added to cast iron. Carborundum Co., Niagara Falls, N. Y. (B 148)

Electric Furnaces

Bulletin No. 51 describes a few of the furnaces manufactured by this company. C. I. Hayes, Inc., Providence, R. I. (B 149)

Car Hearth Furnaces

Bulletin C-736 is devoted to these furnaces which were designed for uniform heating, sturdy construction and fuel economy. The Philadelphia Drying Machinery Co., Philadelphia, Pa. (B 150)

Silico-Manganese Spring Steel

Extreme care is taken in processing this steel to avoid imperfections, to obtain cold-shearing qualities and to insure both high inherent fatigue resistance and uniform heat treating characteristics, according to the manufacturer. Illustrated. Bethlehem Steel, Bethlehem, Pa. (B 151)

Ramming Mix

It is claimed that P. B. Sillimanite ramming mix can be used under the most severe operating conditions without deterioration. Instructions for installation are among the data in a folder of the Chas. Taylor Sons Co., Cincinnati, O. (B 152)

Heat in Industry

A well illustrated booklet entitled "Wherever Heat is Used in Industry" gives a picture of this company's products and service. Surface Combustion Corp., Toledo, O. (B 153)

Electro-Granodizing

This process which, according to the manufacturers, provides a rust-proof, paint-receptive surface is described in an illustrated leaflet of the American Chemical Paint Co., Ambler, Pa. (B 154)

3300 Deg. Super Refractory

An illustrated catalog devoted to "Shamva" Mullite contains information regarding its background, characteristics and uses. Mullite Refractories Co., Shelton, Conn. (B 155)

Furnaces

Information concerning Hausfeld modern melting equipment for die casting is featured in an illustrated leaflet. Campbell-Hausfeld Co., Harrison, O. (B 156)

Steel Castings

A number of the more popular carbon, alloy and stainless steels made by this company are discussed in a leaflet which contains photographs of some typical castings made from them. Lebanon Steel Foundry, Lebanon, Pa. (B 157)

Testing Machines

Catalog 50, Part L, features Olsen Universal testing machines. Complete descriptions and illustrations. Tinius Olsen Testing Machine Co., Philadelphia, Pa. (B 158)

Dipping Baskets

If none of the 14 standard designs meets the customer's approval, this company will manufacture baskets to specifications. C. O. Jelliff Mfg. Corp., Southport, Conn. (B 159)

Zinc Metals and Alloys

Composition and properties of these alloys are given in a booklet prepared by this company. Tables comparing their properties with other metals used for engineering purposes are included. The New Jersey Zinc Company, New York, N. Y. (B 160)

Finish Baking and Drying Ovens

Ovens for various finishing processes are featured in two new bulletins, pages 101-104 of Section A-5, which have been issued by the Despatch Oven Co., Minneapolis, Minn. (B 161)

Heavy-Duty Black

Triple-A No. 20 heavy-duty black is the full name of this coating for steel which, according to the manufacturer, resists acids, alkalies, brine, moisture, abrasion and sulphurous fumes. Quigley Co., Inc., New York, N. Y. (B 162)

The Metal Analyst

Equipment for metallurgical laboratories is described and illustrated in a booklet of Adolph I. Buehler, Chicago, Ill. (B 163)

Electric Heating Elements

A bulletin from this company is devoted to their electric heating elements and terminal accessories for industrial applications. Globar Div., Carborundum Co., Niagara Falls, N. Y. (B 164)

Sixteen Sins of the Cleaning Room

Are listed in a circular for convenience in checking on cleaning rooms. Great Lakes Foundry Sand Co., Detroit, Mich. (B 165)

Cor-Ten and Man-Ten

Pamphlet describing high-tensile steels developed to meet the needs of the transportation industry. United States Steel Corp., Pittsburgh, Pa. (B 166)

Micromax Thermocouple Pyrometers

A new catalog, N-33A, explains the potentiometer method of measurement, the operation of the mechanisms through which this balance method is made available to industry. Leeds & Northrup Co., Philadelphia, Pa. (B 167)

The Jetal Process

Simple immersion in an aqueous bath for about 5 minutes colors all grades of common iron or steel a brilliant and uniform jet black. It is claimed it does not alter dimensions or articles and cannot chip, scale, peel or discolor. Alrose Chemical Co., Providence, R. I. (B 168)

Fire Clay Products

A folder contains brief descriptions of the Goose Lake Products and Therm-O-Flake (for high temperature insulation) products. Illinois Clay Products Co., Joliet, Ill. (B 169)

Heat Exchanger

Bulletin No. 173 describes the Duriron heat exchanger which is available in the company's corrosion-resisting alloys—Duriron, Durichlor, Durimet, Durco Alloy Steel and Alcumite. Illustrated. Duriron Co., Dayton, O. (B 170)

Spectrometric Equipment

Catalog D-221 is devoted to the above equipment. Basic theory and designs are described as well as the various types of instruments. Illustrated. Bausch & Lomb Optical Co., Rochester, N. Y. (B 171)

Special Atmospheres in the Heat Treatment and Brazing of Metals

A reprint of the above article by C. L. West, Research Engineer, is offered by The Electric Furnace Co., Salem, O. (B 172)

Hy-Speed Case

This new product which can be used from 900 to 1100 deg. F. on high speed tools or those requiring red hardness at elevated temperatures, is described in a colorful leaflet. A. F. Holden Co., New Haven, Conn. (B 173)

Phosphor Bronze

A leaflet lists the sizes in which the company's twelve-inch stock bushing bars are now offered. The Phosphor-Bronze Smelting Co., Philadelphia, Pa. (B 174)

Stainless and Heat-Resisting Steels

A colorful booklet devoted to the Enduro line of steels illustrates many of the applications. Republic Steel Corp., Massillon, O. (B 175)

Electric Air Tempering Furnace

Comparative costs in operation of the new air tempering furnace and the old salt bath show a distinct saving by the use of the new furnace, as well as improvement in quality and uniformity, according to Leaflet 36A of the American Electric Furnace Co., Boston, Mass. (B 176)

Stainless and Heat Resisting Electrodes

A colorful price list and data book containing complete descriptions of the company's products and also analyses of stainless and heat resisting alloys manufactured by other companies has been issued by Maurath, Inc., Cleveland, O. (B 177)

Cataloy Lead Bronze

This process which is guaranteed to perfectly combine copper and lead in your own plant is described in literature from Cataloy, Los Angeles, Cal. (B 178)

Heavy Duty Refractories

This handbook contains complete descriptions, applications, tables and illustrations of standard shapes. Many useful engineering data are included. Norton Company, Worcester, Mass. (B 179)

Alloy Steels

A colorful folder devoted to these steels lists some of the advantages to be obtained by their use. Bliss & Laughlin, Inc., Harvey, Ill. (B 180)

MANUFACTURERS' LITERATURE

Bimetal

A simplified version of its manufacture and the way it works is contained in this pamphlet. W. M. Chace Co., Detroit, Mich. (B 231)

Braze-Rite Furnace

This furnace, developed principally for brazing sintered carbide cutting tools, provides for localized heat to be applied only to the portion of the tool to be brazed. Firth-Sterling Steel Co., McKeesport, Pa. (B 232)

Stainless Steel Castings

An attractive booklet contains useful information on the subject. Typical analyses, characteristics and suggested uses are listed. Joseph T. Ryerson & Son, Inc., Chicago, Ill. (B 233)

Automatic Optical Pyrometer

Bulletin No. 91-1, second edition, is devoted to the Brown Optimatic System, which is an optical pyrometer for measuring surface temperatures of hot materials instantaneously and recording automatically on a graphic instrument all variations of temperature during the period that the hot body is viewed. The Brown Instrument Co., Philadelphia, Pa. (B 234)

Mallory Elkon

Looseleaf catalog containing engineering data with descriptions, illustrations and recommendations for the selection of electrical contacts for all types of service. P. R. Mallory & Co., Inc., Indianapolis, Ind. (B 235)

Titanium in Steel

The application of titanium in forgings, castings, rails, sheets and plates is described in a booklet devoted to the use of ferro-carbon-titanium in steel. Titanium Alloy Mfg. Co., Niagara Falls, N. Y. (B 236)

Salt Bath Furnace

The Ajax-Hultgren electrically heated salt bath was designed to meet the metallurgical requirements of liquid heat treating operations. Bulletin 103 lists some of the advantages of the furnace. Illustrated. Ajax Electric Co., Inc., Philadelphia, Pa. (B 237)

Sand Control in the Foundry

A colorful pamphlet lists the major causes of casting defects and inferiorities and states that they may be avoided by the use of the proper sand control equipment. Illustrated. Harry W. Dietert Co., Detroit, Mich. (B 238)

The New Arc Welding Technique

The new "Shield-Arc S.A.E." Welder which is described and illustrated in a colorful pamphlet gives an arc to suit every application according to the manufacturer. The Lincoln Electric Company, Cleveland, O. (B 239)

Hi-Steel

Information concerning chemical composition, physical properties and corrosion resistance of this steel is offered by the Inland Steel Company, Chicago, Ill. (B 240)

Chapmanizing

A pamphlet devoted to Chapmanizing, which is a process of hardening low-carbon steel, compares it to nitriding and carburizing. The Chapman Valve Mfg. Co., Indian Orchard, Mass. (B 241)

Fuel Gas for Welding and Cutting

An illustrated booklet contains the claim that no other gas can compete with acetylene for welding and cutting when correct oxy-acetylene practice is followed because its natural thermal advantages make it, despite its high price, the most economical as well as the most effective agent. Air Reduction Sales Co., New York, N. Y. (B 242)

High Frequency Electric Power Converters

According to illustrated pamphlets, this company manufactures high frequency electric converters for use in conjunction with numerous industrial induction heating applications. Lepel High Frequency Laboratories, Inc., New York, N. Y. (B 243)

Everdur

This metal is a high strength, non-magnetic, non-sparking alloy of the solid solution type composed of copper, silicon and other controlled elements, according to this illustrated leaflet. American Brass Co., Waterbury, Conn. (B 244)

Brazing Alloys

The results of both laboratory and actual production data are contained in Bulletin No. 1 entitled "How to Use 'Handy' Silver Solders, Sil-Fos and Easy-Flo Brazing Alloys." Handy & Harman, New York, N. Y. (B 245)

Superficial Hardness Tester

Catalog Supplement RS-3 is devoted to this hardness tester, which is a special purpose machine, intended exclusively for hardness tests where only very shallow penetration is possible and where it is desired to know the hardness of the specimen close to the surface. Wilson Mechanical Instrument Co., New York, N. Y. (B 246)

Ring Type Proving Instruments

These instruments for checking materials testing machines are pictured in a leaflet which states that they are made in eleven capacities—compression only and compression and tension both. Morehouse Machine Co., York, Pa. (B 247)

Heat and Corrosion Resistant Alloys Heated By Gas

Bulletin C1-A illustrates a number of complex castings made from Q-Alloys which are recommended for pipe fittings, furnace parts, etc. General Alloys Co., South Boston, Mass. (B 248)

Temperature Control

An all electric automatic control which operates on the radio principle is described in an illustrated leaflet. Wheelco Instruments Co., Chicago, Ill. (B 249)

Fuel and Electric Furnaces

Tests, such as are described in an article "A Study of Fuel and Electric Furnaces" show definitely whether proper heat treatment is being obtained at the lowest cost. Reprints are distributed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. (B 250)

Beryllium Copper

Data on properties, heat treatment and fabrication of this copper alloy are given in an illustrated leaflet of The Beryllium Corp. of Penn., Reading, Pa. (B 251)

Controlled Atmosphere Electric Furnaces

Typical installations for annealing or normalizing, hardening and electric-furnace brazing are contained in a booklet which lists the advantages to be derived by the use of these furnaces. General Electric Co., Schenectady, N. Y. (B 252)

Arc Welding

A profusely illustrated booklet is devoted to modern arc welding equipment. Different models for meeting various requirements are described. The statement that all welding problems are simplified by the use of this all purpose welder is made. The Hobart Bros., Troy, O. (B 253)

Current Measurements

The Crompton tong test ammeter is the subject of a colorful leaflet which tells what the tong test does, what its features are and what it is useful for. It is a compact, precision-made instrument and, according to the manufacturer, is practically indispensable for making measurements on poles, cranes and similar work. Columbia Electric Mfg. Co., Cleveland, O. (B 254)

The Oxygen Lance

What it is, how it is used and what it will do are the features of a booklet which contains the statement that the lance can be useful for many every-day jobs, and that advantage is being taken of this knowledge. The Linde Air Products Co., New York, N. Y. (B 255)

Kramer Alloy News

Interesting data of interest to users of non-ferrous ingot metals are contained in all the issues of this publication of the H. Kramer & Co., Chicago, Ill. (B 256)

New Equipment and Materials

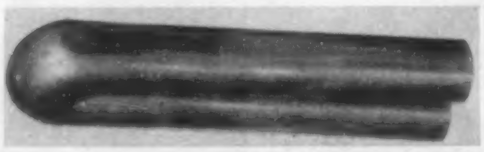
"Speed Case" Steels, High in Carbon and Sulphur

The Monarch Steel Co., Indianapolis, Ind., has recently developed three types of its so-called "Speed Case" steel. The new types are designated X1515, X1535 and X1545, and are made by the Speed Case process in the higher carbon ranges, such as 0.30 to 0.40 and 0.40 to 0.50 per cent C. The company states that these steels have proven to be as exceptional in their carbon range as the same special brand in the low-carbon, case-hardening range. Speed Case steel is designated as X1515, "Speed Treat" 0.30 to 0.40 C as X1535, and Speed Treat 0.40 to 0.50 C as X1545.

The rather arresting statement is made that it has been possible to hold the S in these steels between 0.20 to 0.30 per cent, aiming at an average of 0.25, and that the steels show very fast machinability, exceptional strength and ductility, far greater than the ordinary steels in the same carbon range. For example, Speed Treat X1535 in the form of a 1-in. round bar, cold drawn, can be bent flat or tied into a knot and pulled tight without any sign of fracture.

The company asserts that, for a steel having 0.25 per cent S and high carbon, almost as good machinability is assured as S.A.E. 1112 Bessemer steel and that this opens up an entirely new field.

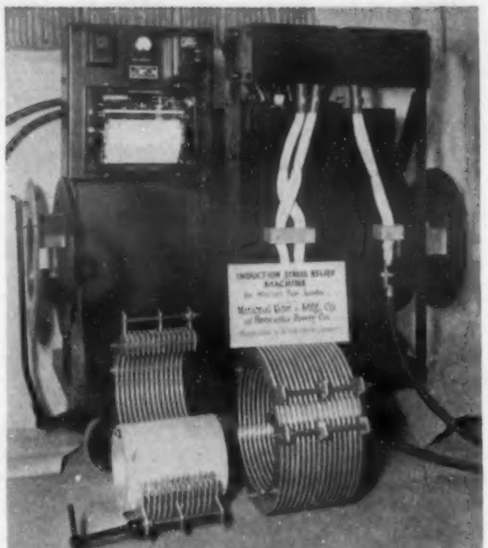
One of the accompanying illustrations shows a 1-in. round, cold drawn, bar of Speed Case or Speed Treat X1515 bent flat on itself in a 150-ton press. It contains, according to the company, 0.15 to 0.20 C and 0.20 to 0.30 per cent S with high manganese. The photomicrograph at 100 diameters is of a polished section of the same steel.



Hundreds of physical tests, says the company, have been made on Speed Case steel, both by the company, steel mills, independent laboratories, large manufacturers and users, and the following table shows Speed Case as compared to standard low-carbon, open-hearth carburizing steels:

	Surface ft. Per min.	Machin-ability	Tensile p.s.i.	Yield p.s.i.	Elon in. 2 in. %	Red. Area %
SPEED CASE	190-210	120	85,000	80,000	26	48
SAE X 1315	130	93	82,500	64,000	17	56
SAE X 1314	135	94	79,500	62,000	19	49
SAE 1020	110	54	74,000	62,000	19	52
SAE 1040	115	60	94,000	83,000	16	46
*SAE 1112 Bess. ...	150	100	80,000	64,000	15	46

* Brittle Bessemer steel. These figures are all based on 1" round cold drawn bars.



Stress Relief Equipment for Welded Joints

Power plant construction engineers are now demanding stress relief equipment for welded joints where high pressures and temperatures are used for speed and uniformity of heating. The above apparatus uses 60-cycle inductive current and is being applied by such companies as New York Edison, American Gas & Electric, Detroit Edison and in this photograph of National Valve Co.'s equipment, The Steam Electric Station at Omaha, Neb. The photograph is from the Detroit Electric Furnace Co., Detroit.

New Line of Electric Flow Meters

The Bristol Co., Waterbury, Conn., announces the addition of a complete line of "Electric Flow Meters" for steam, liquids, and gases to its line of mechanical flow meters. These flow meters operate on the Bristol metameter principle of telemetering, which the company has used for several years in instruments to transmit readings of pressure, liquid level, temperature, and motion from the point of measurement to a distant point where they are recorded or indicated on a dial.

Bristol's Electric Flow Meters can be furnished for recording, integrating, and indicating flow. The readings are transmitted over a simple two-wire circuit, telephone circuits included, which does not enter into the calibration of the instruments. All electrical contacts are enclosed in glass. A standard Bristol meter body is employed to measure the differential across an orifice. High accuracy is obtained at all points on the scale.

Both the transmitter and the receiver are equipped with moisture-, fume-, and dust-proof aluminum alloy cases. Conduit openings are provided so that the instrument may be used with modern wiring systems.

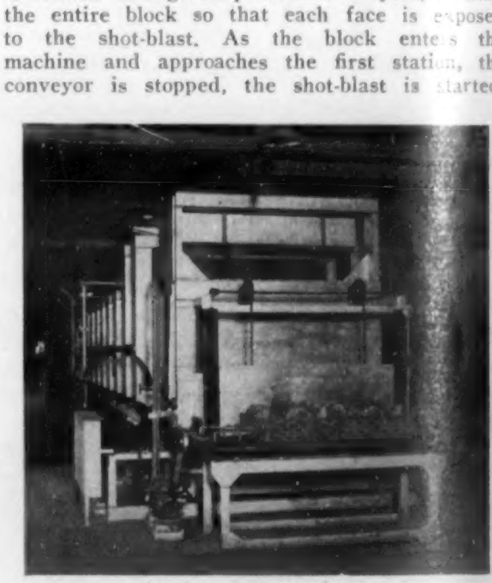
Shot-Blast for Cleaning Buick Cylinder Blocks

Taking advantage of the funds available in the $14,500,000 modernization program recently announced by H. H. Curtice, president of Buick Motor Company, the great Buick foundry in Flint, Mich., has installed two new machines for automatically cleaning cylinder block castings. These are known as the Pangborn "shot-blast" machines and were developed by the Buick foundry engineers.

Those familiar with automobile foundry operations will recall that the cleaning of large castings such as the cylinder block necessarily involves considerable discomfort to the workers because of dust and flying chips. And the discomfort has been a part of the job regardless of goggles, masks, and other safety appliances that are provided.

At Buick the foundry workers are relieved of all the messy cleaning operations on the cylinder blocks. As the blocks come in from the knock-out, they are hooked on the overhead conveyor and transported to the Pangborn machine, illustrated here. The movement of the feeder conveyor is intermittent and automatically controlled by a timing device which is a part of the machine. The machine has four shot-blasting stations, each independently driven, and each one set at a different level so as to reach a particular section of the casting.

Instead of the usual conveyor hook, the conveyor is fitted with a geared hanger which is rotated at a given point in the cycle, turning the entire block so that each face is exposed to the shot-blast. As the block enters the machine and approaches the first station, the conveyor is stopped, the shot-blast is started,



and then the block is turned on its hook through 1¼ revolutions. This assures a thorough cleaning all around and in the pockets. Then the conveyor starts moving and presents the block to the second shot-blast. The same operation continues as before and the block is shot-blasted at each of four stations before it emerges from the machine.

So far as the observer is concerned, there are always four blocks in the machine, once the operation has started, and the conveyor chain alternately starts and stops taking in a rough block and delivering a perfectly cleaned block at the other end. The timing of the machine is variable and may be accommodated to the desired daily production schedule. In general the machine can clean blocks in this fashion at the rate of from 180 to 300 blocks per hr., depending upon the design.

The use of this new machine not only relieves the foundry workers of a hazardous operation but it contributes in a great measure to the good housekeeping program since it eliminates one great source of dirt and dust. These Buick-Pangborn designed machines are the first of their kind and are expected to pay for themselves by the improved working conditions and lower cleaning costs.

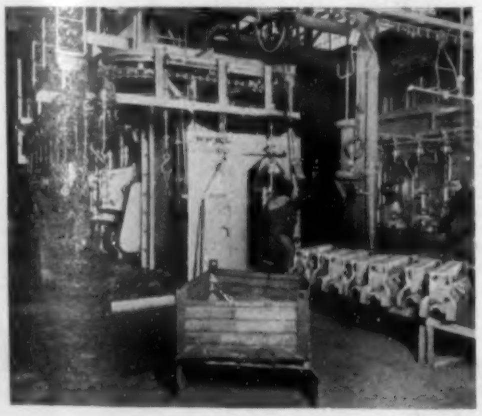
Short Cycle Malleable Castings Clean Annealed in New, Continuous Equipment

A new type of continuous, special atmosphere furnace for scale-free annealing short cycle malleable castings was recently placed in operation in a prominent malleable iron foundry. This furnace, which is of the continuous roller hearth type, handles 30 tons net per day, operating on a cycle requiring approximately 13 hrs. in the furnace. This equipment has worked out so successfully on this process that a duplicate furnace will shortly be installed in this same plant for this purpose.

The material annealed consists of miscellaneous shapes of both small and large castings. The castings are loaded into alloy trays or baskets which travel through the furnace in two parallel rows directly on specially designed rollers which serve as the furnace hearth.

The trays are loaded on a loading extension at the charging end of the furnace. At a suitable time interval the charging door of the charging vestibule opens, and an auxiliary high speed drive mechanism rapidly charges the loaded trays into the vestibule. This door then closes and the door of the actual heating chamber automatically opens and the material is conveyed into the heating chamber. The material is then slowly and continuously conveyed through the heating and cooling chambers. The trays, on reaching the discharge position, actuate a limit switch which automatically opens the discharge door and the material is rapidly delivered to a gas lock chamber or vestibule. This door then closes and the material is moved out onto a 2-tray transfer car and dumping equipment. The empty trays are then placed on a gravity conveyor extending along the side of the furnace and carried to the charging end where they are again loaded and the above cycle repeated.

The furnace is, of course, built gas tight. A special nonoxidizing atmosphere is used throughout the heating and cooling chambers and the castings are discharged from the furnace uniformly annealed and absolutely scale-



free. The special atmosphere used in the equipment is produced in an Elfurno gas generator located beside the furnace and which is part of the equipment.

The heating elements used are heavy, cast, Ni-Cr alloy grids located in both the roof and bottom of the heating and soaking chambers, above and below the material being heated. The heating elements are divided into 7 separately and automatically controlled zones.

While the above equipment is approximately 120 ft. long and is designed to handle 30 tons per day and to operate on a 13-hr. cycle, this same type equipment may be designed for larger or smaller capacities and cycles other than the above—this being determined by the production requirements of the user and the kind or type of material to be annealed. The complete equipment, including furnace, gas generator, dumping equipment, etc., was designed and built by the Electric Furnace Co., Salem, Ohio.

The illustration shows the charging end of this continuous, special atmosphere furnace showing two trays of castings ready to be pushed into the furnace. No packing material is used for protecting the castings.

Increasing The Utility of Chemical Rust-Proofing Processes

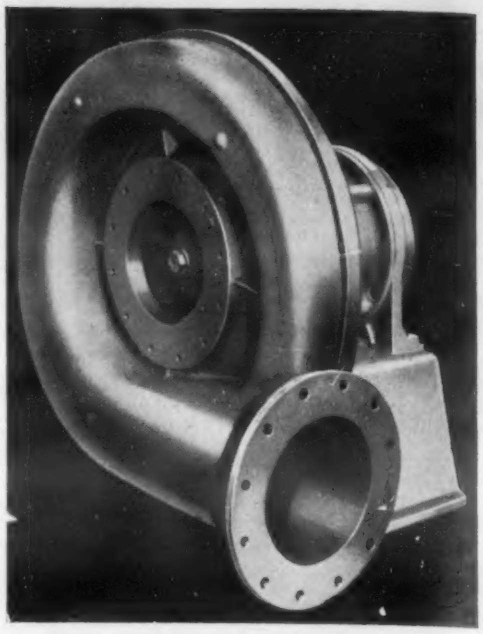
Until recently, practically all of the chemical rust-proofing processes in commercial use were formulated to react on iron and steel only. However, one of the largest concerns in the business of producing rust-proofing chemicals has been doing a lot of research work in the development of formulae that will react on other metals and recently announced a new process that produces a corrosion inhibiting coating on galvanized, zinc alloy and cadmium surfaces, as well as on iron and steel.

In addition to being corrosion resistant, the coating is highly adherent, being integral with the metal itself, and having slight porosity, it is said to form an ideal base for any type of paint finish.

This process is called Dip-Spra Bonderizing by its sponsors, the Parker Rust-Proof Co. It is a new method of application, whereby the effectiveness of a prior process, Spra-Bonderizing, is adapted to the needs of the producer, whose requirements do not justify the installation of conveyor equipment. In other words, it combines the coating efficiency of Spra-Bonderizing with the lower equipment costs and convenience of an immersion process, as well as widening the utility of Bonderizing to include certain non-ferrous metals.

This new process will be of interest to many manufacturers whose products must be painted, especially those who have had some difficulty in getting effective adherence of paint to galvanized or other zinc coated surfaces. It is claimed that the coating produced by this process will increase the paint holding efficiency from 5 to 7 times, which has been amply demonstrated by many accelerated tests in the Parker laboratories.

The equipment requirements are comparatively simple and easy to install, consisting only of a steam heated processing tank of suitable size, in which a spray pipe is placed above the solution level. This spray pipe is plain stainless steel, drilled with a series of ⅛-in. holes from 2 to 4 in. apart, through which the solution is circulated by a small pump, placed at one end of the tank. Large or deep tanks are fitted with a spray pipe on each side.



A New Motorblower

The "Type CS Motorblower" has been especially designed to meet the needs of the numerous services requiring air at 1-lb. pressure, and in volumes from 325 to 3200 cu. ft. per minute.

The manufacturer claims that this motorblower is especially adapted to the job of furnishing air to furnaces at constant pressure, regardless of the variation in the number of burners in use. Motorblowers of this type are particularly suited to industries wherever oil- or gas-fired furnaces are used.

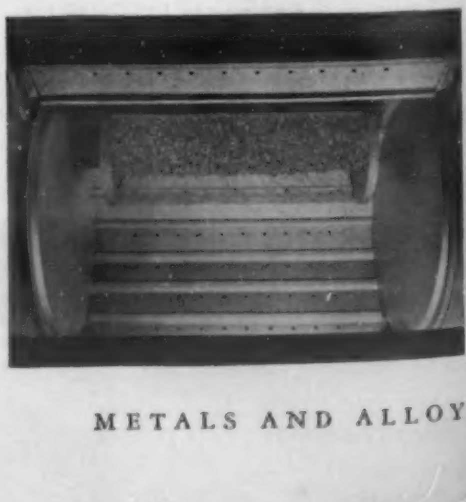
A copy of Bulletin No. 2310, describing the Motorblower, may be obtained from the Ingersoll-Rand Co., 11 Broadway, New York, or any branch office.

Wheelabrator Cleans Minute Metal Parts

Small metal stampings weighing as little as 1/283 oz. are being cleaned successfully in American Wheelabrator Tum-Blast equipment, manufactured by the American Foundry Equipment Co., 555 South Brykit St., Mishawaka, Ind., preparatory to nickelplating.

These stampings are cleaned in cylindrical wire mesh baskets which roll over and over in the abrasive blasting zone, causing a constant turning and cascading of the tiny stampings and exposing them to the scrubbing action of the blast. Wire baskets are constructed of number 6 mesh wire with solid ends made of 14-gage steel. A gate for filling or emptying the baskets is firmly bolted to one end. Theoretically these wire baskets are used as auxiliary, horizontal barrels in conjunction with the American Wheelabrator Tum-Blast. Fine number 90 steel grit is the abrasive used for the cleaning. A surface suitable for nickelplating is obtained after only 30 min. of wheelabrating.

Centrifugal force replaces compressed air as the driving agent in whipping abrasive onto the material to be cleaned in the Wheelabrator.



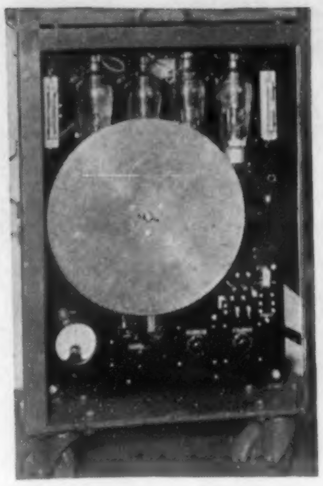
New Process Cuts Beryllium Price

The Brush Beryllium Co. of Cleveland has announced a new low price of \$23 per lb. for Beryllium content, hitherto priced at \$30 per lb. and above, in making public the news of its entrance into the general market for beryllium copper master alloy.

The concern is one of the Brush group of enterprises in the fields of electrical and chemical engineering and metallurgy founded by the late Charles Francis Brush, inventor of the arc light, whose initial Brush Electric Co., established in 1880, was later merged into the General Electric Co., and who was founder and first president of Linde Air Products Co.

A simultaneous statement issued by Brush Beryllium emphasized that the new price resulted from development of new and distinctive processes which, it was predicted, would result in much wider application of beryllium copper. The metal, which imparts unusual qualities of fatigue, corrosion, heat resistance, and non-sparking and high impact strength, is now in use in a wide variety of services ranging from watch parts to airplane propeller hub-cones, and from crowbars to delicate surgical instruments.

The ore from which it is derived has a chemical composition very close to that of emerald or aquamarine and may properly be called a crude form of aquamarine. While sources of supply were previously limited, the ore is now appearing in larger quantities at slightly decreased prices. Availability of the ore, coupled with the lower price of beryllium content and the simultaneous pick-up of both the machine tool industry and industrial construction, is seen as forecasting development of faster and more involved types of industrial products.



Ignitron Seam Welder

A new ignitron seam welder control utilizing ignitron tubes has been announced recently by the Westinghouse Electric & Mfg. Co. This control times power impulses in terms of a definite number of power cycles to a wheel type electrode resistance welding machine. Among its features is an inductive timer, consisting of a synchronous driven disc rotating once per second and containing 120 holes, each corresponding to a half cycle of welding current. Also, the use of ignitron tubes permits a design utilizing no voltages higher than line voltages and eliminating the need of power contactors and transformers. Steel pins are plugged into the holes according to the timing desired. The new control is simple, durable, and the timing is precise. Its use greatly improves the quality of welds for even very light gage steels. It is especially suitable for welding heavy gage steels, demanding heavy welding currents, and special alloys demanding accurate timing and often heavy current such as aluminum and olympic bronze.

Aluminum Reflectors for High Intensity Mercury Lighting

Aluminum reflectors designed to properly distribute light from the 400-watt High Intensity Mercury lamp where the mounting height is 18 ft. and over, have been announced by the Westinghouse Electric and Mfg. Co. These units are particularly suited for the general lighting of foundries, machine shops, stamping departments, power plants, receiving and shipping departments and sheet metal departments.

The high mounting reflectors are made from 14 gage commercially pure aluminum sheet. Their shape is such as to make them especially strong and durable after fabrication. A special Mogul type socket is rigidly mounted in the hood to position the lamp properly in the reflector.

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